



Maharashtra State Board of Technical Education, Mumbai
Teaching and Examination Scheme for Post S.S.C. Diploma Courses

Program Name : Diploma in Information Technology

Program Code : IF

With Effect From Academic Year: 2017 - 18

Duration of Program : 6 Semesters

Duration : 16 Weeks

Semester : Fifth

Scheme : I

S. N.	Course Title	Course Abbreviation	Course Code	Teaching Scheme			Credit (L+T+P)	Examination Scheme													Grand Total
				L	T	P		Theory							Practical						
								Exam Duration in Hrs.	ESE		PA		Total		ESE		PA		Total		
									Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	
1	Environmental Studies	EST	22447	3	-	-	3	90 Min	70*#	28	30*	00	100	40	--	--	--	--	--	--	100
2	Operating Systems	OSY	22516	3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20	150
3	Advanced Java Programming	AJP	22517	3	1	2	6	2	70*#	28	30*	00	100	40	25#	10	25	10	50	20	150
Elective (Any One)																					
4	Client Side Scripting Language	CSS	22519	3	-	2	5	3	70	28	30*	00	100	40	25#	10	25	10	50	20	150
	Advanced Computer Network	ACN	22520	3	-	2	5	3	70	28	30*	00	100	40	25#	10	25	10	50	20	150
	Open Source Operating Systems & Scripting Language	LOS	22522	3	-	2	5	3	70	28	30*	00	100	40	25#	10	25	10	50	20	150
5	Enterprenureship Development	EDE	22032	2	-	2	4	--	--	--	--	--	--	--	50@	20	50~	20	100	40	100
6	Industrial Training	ITR	22057	-	-	6	6	--	--	--	--	--	--	--	75#	30	75	30	150	60	150
7	Capstone Project Planning	CPP	22058	-	-	2	2	--	--	--	--	--	--	--	25@	10	25	10	50	20	50
Total				14	1	16	31	--	280	--	120	--	400	--	225	--	225	--	450	--	850

Student Contact Hours Per Week: **31 Hrs.**

Medium of Instruction: **English**

Theory and practical periods of 60 minutes each.

Total Marks : 850

Abbreviations: ESE- End Semester Exam, PA- Progressive Assessment, L - Lectures, T - Tutorial, P - Practical

@ Internal Assessment, # External Assessment, *# On Line Examination, ^ Computer Based Assessment

* Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain LOs required for the attainment of the COs.

~ For the courses having ONLY Practical Examination, the PA marks Practical Part - with 60% weightage and Micro-Project Part with 40% weightage

➤ **If Candidate not securing minimum marks for passing in the "PA" part of practical of any course of any semester then the candidate shall be declared as "Detained" for that semester.**

➤ **Evaluation of Industrial Training and its reports is to done after completion of Industrial Training. Credits of Industrial Training will not affect the framing of time table.**



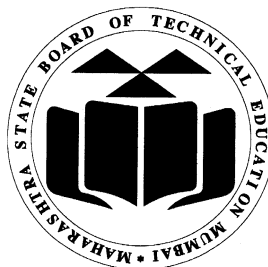
Assessment Manual

For

**Micro Projects / Industrial
Training**

_____ **Engineering Programme**

(I Scheme Curriculum)



**Maharashtra State
Board of Technical Education, Mumbai**
(Autonomous) (ISO-9001-2008) (ISO/IEC 27001:2013)

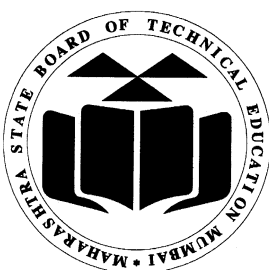
Assessment Manual

For

Micro Projects (Part A)

_____ **Engineering Programme**

(I Scheme Curriculum)



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Preface

The primary focus of any engineering laboratory/ field work in the technical education system is to develop the much needed industry relevant competencies and skills. With this in view, MSBTE embarked on this innovative 'I' Scheme curricula for engineering diploma programmes with outcome-based education (OBE) as the focus and accordingly, relatively large amount of time is allotted for the practical work and micro project. This displays the great importance of micro project work making each teacher; instructor and student to realize that every minute of the laboratory time need to be effectively utilized to develop these outcomes, rather than doing other mundane activities. Therefore, for the successful implementation of this outcome-based curriculum, every course has been designed to serve as a '**vehicle**' to develop this industry identified competency in every student. The practical skills are difficult to develop through 'chalk and duster' activity in the classroom situation. Accordingly, the 'I' scheme micro project assessment manual development team designed the micro project outlines **focus** on the **outcomes**, rather than the traditional age old practice of conducting practicals to 'verify the theory' (which may become a byproduct along the way).

This micro project assessment manual is designed to help all stakeholders, especially the students, teachers and instructors to develop in the student the pre-determined outcomes. It is expected from each student that at the beginning of term for all related courses s/he must finalized team members and title of micro project under the guidance of course faculty. Every micro project in this manual begins by identifying the competency, industry relevant skills, course outcomes and practical outcomes which serve as a key focal point for doing the micro project. The students will then become aware about the skills they will achieve through procedure and end product in solving real-world problems in their professional life.

This manual also provides guidelines to teachers and instructors to effectively facilitate student-centered lab activities through each micro project by arranging and managing necessary resources in order that the students follow the procedures and precautions systematically ensuring the achievement of outcomes in the students.

The micro project assessment manual development team wishes to thank NITTTR, Bhopal who work as consultant in the development of curriculum re-design project and also acknowledge the contribution of individual course experts who have been involved in laboratory manual as well as curriculum development (I scheme) directly or indirectly.

Although all care has been taken to check for mistakes in this micro projects assesment manual, yet it is impossible to claim perfection especially as this is the first edition. Any such errors and suggestions for improvement can be brought to our notice and are highly welcome.

Certificate of Completion

of Micro-Project Assessment at the end of the Diploma Programme

(by respective Head of the Department & Head of the Institute)

This is to certify that Mr./Ms.....with
Enrollment No..... has successfully completed Micro-projects as in the
enclosed 'Portfolio' during his/her tenure of completing the Diploma programme in
.....from
..... institute
with institute code.....

Head of the Department

Seal

Head of the Institute

Certificate of Completion

Of Industrial – Training Assessment at the end of the 5th semester

(by respective Head of the Institute & hear of the Department)

This is to certify that Mr/Ms.....with
Enrollment No.Has successfully completed Industrial
Training indaily To
..... his / her tenure of completing the Diploma Program in
.....from
Institute Code.....

Head of the Department

Seal

Head of the Institute

**Summary Sheet of the Micro Projects Completed During the 3-year Engineering
Diploma Programme**

S. No.	Name and code of course	Title of the Micro Project	Name of Guide	Signature of Guide
Semester – I				
1				
2				
3				
4				
5				
6				
Semester – II				
7				
8				
9				
10				
11				
12				

Semester – III				
13				
14				
15				
16				
17				
18				
Semester – IV				
19				
20				
21				
22				
23				
24				

Semester – V				
25				
26				
27				
28				
29				
30				
Semester – VI				
31				
32				
33				
34				
35				
36				

GUIDELINE DOCUMENT FOR MICRO-PROJECTS OF 'I' - SCHEME

1.0 INTRODUCTION

Project work is the activity that is intended to integrate all the domains of learning i.e. cognitive, psychomotor and affective domains wherever applicable, the hence it is very important from the teacher and student point of view. Any project work is *not a research*, but an experience of doing some complex work by students on their own, or 'work-based learning' Project can be of micro, mini, minor and major levels depending on at what stage of learning (from first semester to the last semester) it is incorporated; but all these categories will have the same characteristics. Only the amount of effort put in and time required will be changing. Therefore, the project work is defined as *'A purposeful student activity planned, designed and performed by a student or group of students to solve the identified problems (or complete a relatively complex task) which requires them to integrate the various types of skills acquired over a period to help them to accomplish higher level of cognitive and affective domain outcomes and sometimes the psychomotor domain outcomes as well'.* (Earnest, Joshua and S. K. Gupta). This definition means that the project work leads to the integration of knowledge, skills and attitudes of the three domains of learning acquired over a period of time. It would field-based, classroom-based, lab-based, internet based, library-based or home-based. Therefore, for a micro-project also, which is related to a single course, it is not purely laboratory or field based. It is decided by pre-defined competency and course outcomes of the particular course. It could of one particular type or a combination of different types, but the efforts by the student need to be of 16 weeks duration during the whole semester i.e. about 1 hour per week outside the classroom, in the home, in the library, laboratory, workshop or field and is intended to integrate the three domains of learning, wherever applicable. Micro-project is also intended to develop the so called '*soft skills*' in the student. Therefore the choice of the micro-project is also crucial.

2.0 SALIENT FEATURES OF MICRO-PROJECT

Every micro-project is basically intended to integrate more than course outcome i.e .more than one unit of the theory and the related practicals stated in the course along with the affective domain skills mentioned over there. Since it is a micro-project for a single course, it is not intended to be very complex and report is not expected to be voluminous. But, every student is expected to devote about 16 hours work for a micro-project in a group or individually during the whole semester. The micro-project report is the end product which need to be given about 25% weightage. The '*process*' is the key which the teacher has to monitor regularly through seminars and other activities typically every fortnight online or otherwise, so that the skills are gradually built up in the students over the period of time.

One of the main purpose of micro-project is to develop the ability to work in real life settings individually or collectively as the situation may be. Following are some of the salient features of the micro-project.

- a) Micro-projects are introduced in each course to take advantage of project method of learning.
- b) The course teacher would be the guide for all groups of his/her class for that course.
- c) Micro-project is a small project which requires about 16 hours of work by students in whole semester. (i.e. about one hour each week)
- d) Students can choose micro-projects other than the sample list after consultation with their teacher.

- e) Micro-project would be given to students as a group work. (Group size should not be more than 6 students).

3.0 ABILITIES INTENDED TO BE DEVELOPED THROUGH MICRO-PROJECT

Following are the major abilities that are expected to be developed in the student through the work of 25 -30 Micro-projects introduced in this outcome-based curriculum not through one course alone, but during the entire the diploma programme of 3 years duration. It is not necessary that every micro-project should develop all the following abilities. *However, some of the abilities mentioned below may be common in many of the micro-projects.*

- a) Show the attitude of enquiry.
- b) Identify the problems in the area related to their branch of the of their diploma programme.
- c) Identify the information suggesting the cause of the problem and possible solutions.
- d) Prepare project proposals before starting the project.
- e) Derive different possible solutions creatively.
- f) Assess the financial implication and feasibility of different solutions based on preliminary studies.
- g) Collect relevant data from different sources (books/internet/market/suppliers/experts and others through surveys/interviews).
- h) Analyse the collected data and to generate useful information from it.
- i) Present generated information visually in form of appropriate charts/graphs.
- j) Prepare required drawings and detailed plan for execution of the work.
- k) Work persistently to achieve the targets.
- l) Attempts alternative solutions/revise aims/execute alternative plans, in case of failures.
- m) Use relevant machines and equipment/instruments safely.
- n) Develop the prototype/model/ of the desired equipment/instrument/machine part and such others.
- o) Show concern for material and cost reduction.
- p) Incorporate safety features in products.
- q) Work independently for the responsibility undertaken.
- r) Participate effectively in group work.
- s) Ask for help from others including guide, when required.
- t) Prepare the technical reports.
- u) Prepare presentations.
- v) Present findings/features of the projects in seminars.
- w) Confidently, answer the questions asked about the project.
- x) Acknowledge the help rendered by others in success of the project.

It is obvious from the above, that it is not necessary to have very innovative idea or to produce something new with the help of micro-project. The main purpose is to develop above skills/attitudes in the students. ***Thus micro-projects should not be very complex or research oriented, they should be such that students can complete it on their own without much help of teacher or from outside the institute.***

4.0 REPORT FOR THE MICRO-PROJECT

The micro-project report has two parts (format is attached as Annexure I). First part is 'Project Proposal' about two pages in 12 point calibri font of 1.2 spacing with margins of 2.5 centimeters, top, bottom, right and left in the format given in the Annexure- I. This is related to the planning, which should be submitted by the end of fourth week of the semester. The purpose of this part is to teach the student to plan and also to ensure that students finalise their title and start working by the fourth week.

The second part is the micro-project report (Annexure II) which is to be submitted after the completion of the project prepared in black and white (no colour printing) of 8 to 15 of A4 size pages depending upon nature of the project (excluding the cover page and initial pages) written in preferably in 12 point calibri font of 1.2 spacing with margins of 2.5 centimeters, top, bottom, right and left of each page.

The sample evaluation of the micro-project has to be undertaken throughout the semester once in a fortnight, section-by-section of the Report format in accordance with Annexure IV to ensure the quality of the ongoing micro-project work to attain the desired COs aimed towards the development of the competency.

5.0 COST OF MICRO-PROJECT

As far as possible, no cost need to be incurred by the student for the micro-project. Since students are supposed to do one micro-project in every course, in case it becomes necessary to incur expenditure of Micro-Project the total cost should not exceed Rs.1000 per project.

Teacher should ensure that the Micro-Project should not become financial burden on students

6.0 ASSESSMENT OF MICRO-PROJECT

Purpose of Micro-project is to not only to give the marks but to give the qualitative feedback to the students and hence rubrics would be used for assessment of the Micro-project. Rubrics are given in Annexure II. Qualitative feedback on project work would be given by teacher by ticking appropriate cells in the rubrics shown in the teacher evaluation sheet. Teachers should make it very clear to the students that marks for the project would be awarded based on the efforts put in by the students and not based on the project report only. **Students who have worked on their own and tried their best but are not able to complete the project should get more marks in comparison to students who got their work completed with the help of others.** Photocopy of evaluated sheet has to be attached by every student with his/her project report.

The following assessment methodology of the micro-project

- a) For each Micro-project 10 Marks is earmarked for progressive Assessment.
- b) A Micro-Project Evaluation format is given in Annexure III.
- c) In this sheet assessor would also mention the Course Outcomes, Practical Outcomes, Unit Outcomes and Affective Domain Outcomes achieved by the project.
- d) Out of 10 Marks 6 marks would be based on the project work. All group members would receive same marks out of 6 Marks
- e) Remaining 4 marks would be based on individual contribution to be decided by teacher by taking viva - voce.

- f) The teacher needs fill only one teacher evaluation sheet for each group and then make multiple copies of the filled teacher evaluation sheet according to the number of students in that group. Then the teacher can give marks out of 4 for after the presentation/viva of each student.

7.0 MICRO-PROJECTS PORTFOLIO:

- a) It is a collection of all the micro-projects completed by the student in the whole diploma programme
- b) Student would go on filling the reports of micro-projects in a portfolio (a kind of folder) along with the 'Teacher Evaluation Sheet' of that project.
- c) In inner page of the initial pages of compiled portfolio there will be a summary sheet of all the micro-projects done by a student through all the three year diploma programme.
- d) Students can use this portfolio in job interviews to show proudly about 30 micro-projects *completed by them in their diploma programme.*

Part – A Micro-Project Proposal
(Format for Micro-Project Proposal A about 2-3 pages)

Title of Micro-Project

1.0 Aims/Benefits of the Micro-Project (minimum 30-50 words)

2.0 Course Outcomes Addressed

- a)
- b)
- c)

3.0 Proposed Methodology

(Procedure in brief that will be followed to do the micro-project) in about 100 to 200 words).

5.0 Action Plan (Sequence and time required for major activity)

S. No.	Details of activity	Planned Start date	Planned Finish date	Name of Responsible Team Members
1				
2				

6.0 Resources Required (major resources such as raw material, some machining facility, software etc.)

S. No.	Name of Resource/material	Specifications	Qty	Remarks
1				
2				

Names of Team Members with Roll Nos.

1.
2.
3.
4.
5.
6.

Part – B Micro-Project Report
(Outcomes after Execution) Format for Micro-Project Report (Minimum 6 pages)

Title of Micro-Project

1.0 Rationale

(Importance of the project, in about 30 to 50 words. This is a modified version of the earlier one written after the work)

2.0 Aims/Benefits of the Micro-Project

3.0 Course Outcomes Addressed (Add to the earlier list if more COs are addressed)

- a)
 b)

4.0 Literature Review

5.0 Actual Methodology Followed.

Write step wise the work was done, including which team member did what work and how the data was analysed (if any).

6.0 Actual Resources Used (Mention the actual resources used).

S. No.	Name of Resource/material	Specifications	Qty	Remarks
1				
2				

7.0 Outputs of the Micro-Projects

(Drawings of the prototype, drawings of survey, presentation of collected data, findings etc.)

8.0 Skill Developed / Learning outcome of this Micro-Project

9.0 Applications of this Micro-Project

Suggested Rubric for Assessment of Micro Project

*(The rubric given below may be modified depending on the type of micro-project. Consider the **SIX most relevant** characteristics for evaluating the microproject)*

(Allot the marks in the appropriate cell given below each criteria)

S. No.	Characteristic to be assessed	Poor (Marks 1-3)	Average (Marks 4 - 5)	Good (Marks 6 - 8)	Excellent (Marks 9- 10)
1	Relevance to the course	Related to very few LOs	Related to some Los	Addressed at-least one CO	Addressed more than one CO
2	Literature Review/information collection	Not more than two sources (primary and secondary), very old reference	At-least 5 relevant sources, at least 2 latest	At –least 7 relevant sources, most latest	About 10 relevant sources, most latest
3	Completion of the Target as per project proposal	Completed less than 50%	Completed 50 to 60%	Completed 60 to 80%	Completed more than 80 %
4	Analysis of Data and representation	Sample Size small, data neither organized nor presented well	Sufficient and appropriate sample, enough data generated but not organized and not presented well. No or poor inferences drawn	Sufficient and appropriate sample, enough data generated which is organized and presented well but poor inferences drawn	Enough data collected by sufficient and appropriate sample size. Proper inferences drawn by organising and presenting data through tables, charts and graphs.
5	Quality of Prototype/Model	Incomplete fabrication/assembly.	Just assembled/fabricated and parts are not functioning well. Not in proper shape, dimensions beyond tolerance limit. Appearance/finish is shabby.	Well assembled/fabricated with proper functioning parts. In proper shape, within tolerance dimensions and good finish/appearance. But no creativity in design and use of material	Well assembled/fabricated with proper functioning parts. In proper shape, within tolerance dimensions and good finish/appearance. Creativity in design and use of material
6	Report Preparation	Very short, poor quality sketches, Details about methods,	Nearly sufficient and correct details about methods, material,	Detailed, correct and clear description of methods, materials,	Very detailed, correct, clear description of methods, materials,

Evaluation as per Suggested Rubric for Assessment of Micro Project

Sr. No.	Characteristic to be assessed	Poor (Marks 1 - 3)	Average (Marks 4 - 5)	Good (Marks 6 - 8)	Excellent (Marks 9- 10)
1	Relevance to the course				
2	Literature Review/information collection				
3	Literature Review/information collection				
4	Analysis of Data and representation				
5	Completion of the Target as per project proposal				
6	Report Preparation				
7	Presentation of the Micro project				
8	Presentation of the Micro project				

Micro-Project Evaluation Sheet

Process and Product Assessment (6 marks) <i>(Note: The total marks taken from the above Rubrics is to be converted in proportion of '6' marks)</i>	Individual Presentation/Viva (4 marks)	Total Marks 10

Comments/Suggestions about team work/leadership/inter-personal communication (if any)

.....

Name and designation of the Teacher

Dated Signature.....

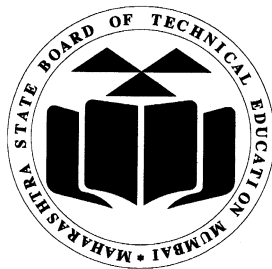
Assessment Manual

For

Industrial Training (Part B)

_____ Engineering Programme

(I Scheme Curriculum)



**Maharashtra State
Board of Technical Education, Mumbai**
(Autonomous) (ISO-9001-2008) (ISO/IEC 27001:2013)

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION (MSBTE)

"I" Scheme Curriculum (Launched in 2017)

6 -Week Industrial Training

Common to all programmes

Name of Course: **Industrial Training (6 weeks duration)****1. RATIONALE**

Industrial training course is introduced to all diploma programmes with the aim to imbibe the industry culture in the students before they enter into world of work. By exposing and interacting with the real life industrial setting, student will appreciate and understand the actual working of an industry, best practices adopted in industry and other requirements in the industry. The industrial needs such as the soft skills, life skills and hands-on practices is intended to be inculcated in the students through this training. This short association with the industry will be instrumental in orienting the students in transforming them to be industry ready after completion of diploma programme.

2. COMPETENCY

This course is intended to develop the following competencies:

- Soft Skills i.e. Communication, Presentation and others.**
- Life Skills i.e. Time management, Safety, Innovation, Entrepreneurship, Team building and others**
- Hands-on Practices i.e. Shop floor Implementation and Quality Assurance aspects.**

3. COURSE OUTCOMES

The industrial training is intended to acquire the competencies as mentioned above to supplement those attained through several courses up to fourth semester of the program:

- Communicate effectively (verbal as well as written) the execute work.
- Prepare the industry report of the executed work.
- Exercise time management and safety in the work environment.
- Work in teams for successful completion of projects assuring quality.

4. TEACHING & EXAMINATION SCHEME

Teaching scheme (In hours)			Total Credits (L+ T+ P)	Examination Scheme				
L	T	P		Theory Marks		Practical Marks		Total marks
				ESE	PA	ESE	PA	
--	--	6	6	--	--	75#	75#	150

Note: Both ESE and PA part of assessment will be carried out by institute faculty and industry training supervisor as explained in table no. 2, 3 and 4

5. GENERAL GUIDELINES FOR INDUSTRIAL TRAINING

The Industries/Organizations can be Government/Public limited/or Private family enterprises.

- Duration of Industrial Training:** Between 4th and 5th semester (Summer Vacation).

- b) **Duration of the training:** Six weeks
- c) **Training Area:** Students should be trained in large and medium scale Industry / Organization. However, despite the best efforts by the institute, if large and medium scale Industry / Organization are not available to all students then, students can also be placed in small scale Industry / Organization.

For **Civil engineering**, it can be public works department, irrigation department, public health engineering, municipal corporations, town and country planning, highway and roads authorities, railways, large and medium scale civil contractors, rural engineering departments, environment corporations, large and medium scale private construction companies, mining companies.

For **Mechanical Engineering**, it can be manufacturing, fabrication, foundry or processing industry which may include compressors, boilers, engines, heat exchangers, air conditioning and refrigeration plants, conveyors etc are either manufactured or used. Power plants, Railways, process plants, ordinance factories, textile factories, automobile manufacturers or major automobile workshops.

For **Electrical engineering**, it can be electricity transmission and distribution companies, power generating stations, sub stations, railways, industries manufacturing electrical products which may include industry where large motors/transformers etc. are used, process plants, electrical contractors.

For **Electronics engineering**, it can be telecommunication companies, post and telegraph department, manufacturer of telecommunication product, manufacturers of control equipments, manufacturer of CNC machines, any manufacturing industry where electronic controls are used either in production process or in its products, computer hardware manufacturers, signal divisions of railways, etc.

For **Computer and IT industries**, it can be any software developers, cyber security companies, web page developers, networking companies, data base management companies, telecommunication companies or IT division of any other industries/finance/retail companies or organisations where software are used and maintained for various applications.

6. ROLE OF PARENT DEPARTMENT OF THE INSTITUTE

Sl. No.	Activity	Schedule
1	Collecting information about Industry / Organization available for training along with capacity (Format - 1)	Before completion of 3 rd semester
2	Student and mentor allocation as per the slots available for in-plant training (Desirable mentor- student ratio is 1:15)	Before commencement of 4 th semester
3	Communication with Industry / Organization available for training along with capacity and its confirmation	Before first Unit Test of the 4 th semester
4	Obtaining consent letter from parents / guardian	Before second Unit Test

Sl. No.	Activity	Schedule
	(Format - 2)	of the 4 th semester
5	Student enrollment for In-plant training (Format - 3)	Before commencement of 4 th semester examination
6	Issue letter to the Industry / Organization for the training along with details of students and mentors. (Format - 4)	During 4 th semester examination
7	Mentors to carry out progressive assessment of the students during the in-plant training (Format - 5)	Each week of training
8	End of training assessment by mentor along with Industry / Organization expert as external examiner (Format - 6)	Before 5 th semester ESE

Suggestions

- Departments can take help of alumni or present students (if they or their parents or relatives have some contact in different industries) for securing placement.
- The students would normally be placed as per their choices, in case of more demand for a particular Industry / Organisation students would be allocated place based on their relative merit. However, if some students have arranged training placement in some companies with the help of their parents/relatives etc. then they will be given preference for placement in those companies.
- Principal/HOD/Faculty should address students about industrial safety norms, rules and discipline to be maintained in the Industry / Organisation during the training before relieving students for training.
- The faculty member during the visit to Industry / Organisation will check the progress of the student in the training, his/ her attendance, discipline and project report preparation.

7. EXPECTATIONS FROM INDUSTRY

Helping institute in developing the following competencies among students

- Soft Skills i.e. Communication, Presentation and others.**
- Life Skills i.e. Time management, Safety, Innovation, Entrepreneurship, Team building and others**
- Hands-on Practices i.e. Shop floor Implementation and Quality Assurance aspects.**

8. ROLES AND RESPONSIBILITIES OF THE STUDENTS

Following should be informed to students in the letter deputing them for the training, an undertaking for this should also be taken from them

- Students would interact with the mentor to suggest choices for suitable Industry / Organization. If students have any contact in Industry / Organization (through their parents, relatives or friends) then same may be utilized for securing placement for themselves and their peers.
- Students have to fill the forms duly signed by authorities along with training letter and submit it to training officer in the industry on the first day of training. Student should also carry with him/her the Identity card issued by institute during training period.

- c) He/she will have to get all the necessary information from the training officer regarding schedule of the training, rules and regulations of the Industry / Organization and safety procedures to be followed. Student is expected to observe these rules, regulations, procedures.
- d) Students should know that if they break any rule of industry or do not follow the discipline then industry can terminate the training and sent back the students.
- e) It is the responsibility of the student to collect information from Industry / Organization about manufacturing processes / testing and quality assurance methods/specifications of machines and raw materials/maintenance procedures/ production planning/organizational structure etc.
- f) During the training period students have to keep record of all the useful information in Log book
- g) Maintain the weekly diary as provided and get it signed from mentor as well as Industry / Organization training in-charge.
- h) In case they face any major problem in industry such as an accident or any disciplinary issue then they should immediately report the same to the institute.
- i) Prepare final report about the training for submitting to the department at the time of presentation and viva-voce and get it signed from mentor as well as Industry / Organization training in-charge.

9. FORMAT FOR TRAINING REPORT

Following is the suggestive format for the training report, actual format may differ slightly depending upon the nature of Industry / Organisation. The training report may contain the following

- Title page
- Certificate
- Abstract
- Acknowledgement
- Content Page

- Chapter 1. Organizational structure of Industry / Organisation and General Lay Out
- Chapter 2. Introduction of Industry / Organisation (Type of products and services, history, turn over and number of employees etc.)
- Chapter 3. Types of major equipment/instruments/ machines used in industry with their specification, approximate cost and specific use and their routine maintenance.
- Chapter 4. Manufacturing Processes along with production planning and control methods.
- Chapter 5. Testing of raw materials, components and finished products along with quality assurance procedures.
- Chapter 6. Major material handling product (lifts, cranes, slings, pulleys, jacks, conveyor belts etc.) and material handling procedures.
- Chapter 7. Safety procedures followed and safety gear used (includes Preventive maintenance schedule and breakdown maintenance procedures).
- Chapter 8. Particulars of Practical Experiences in Industry / Organisation if any in Production/ Assembly/ Testing/Maintenance.
- Chapter 9. Short report/description of the project (if any done during the training)
- Chapter 10. Special/challenging experiences encountered during training if any (may include students liking & disliking of work places)

References /Bibliography

10. SUGGESTED LEARNING STRATEGIES

Students should visit the website of the industry where they are undergoing training to collect information about products, processes, capacity, number of employees, turnover etc. They should also refer the handbooks of the major machines and operation, testing, quality control and testing manuals used in the industry. Students may also visit websites related to other industries wherein similar products are being manufactured as their learning resource.

11. TENTATIVE WEEK-WISE SCHEDULE OF INDUSTRIAL TRAINING

The industrial training is a common course to all programmes; therefore the industry / Organisation selection will depend upon the nature of programme and its related industry. The training activity may vary according to nature and size of Industry / Organisation. The following table details suggestive schedule for industrial training for all programmes.

Table - 2 Detail week schedule and Marks distribution

S. No.	Week No.	Details of activities to be completed during Industrial training	Marks distribution/ week for PA
1	Week No. 1	Induction to industry and its departments	05
2	Week No. 2	Study of layout and specifications of major machines, equipment and raw materials / components / software used.	05
3	Week No. 3	Study of setup and processes/execute project.	25
4	Week No. 4	Study of QA/QC procedures.	10
5	Week No. 5	Study safety and maintenance procedure in an industry/organization	05
6	Week No. 6	Report Writing	00
PA marks to be given by industry supervisor			25
PA marks to be given by polytechnic faculty based on report			25
Total PA marks for training			75

Table - 3 ASSESSMENT SCHEME FOR INDUSTRIAL TRAINING

Training duration	PROGRESSIVE ASSESSMENT (Weekly report of all 6 week and attendance)		END SEMESTER ASSESSMENT (Seminar and Oral)		Total marks	
Six weeks	Max. marks	Min. marks	Max. marks	Min. marks	Max. marks	Min. marks
	#75		75**	30	150	60

**assessed by external examiner based on report (25 Marks), presentation (25 Marks) and Viva-Voce (25 Marks)

Table - 4 Distribution of End-Semester-Examination (ESE) marks of Industrial Training

Marks for Industrial Training Report	Marks for Seminar/ Presentation	Marks for Oral/Viva-voce	Total ESE marks
25	25	25	75

Format1 : Collecting Information about Industry/Organisation available for training alongwith capacity

- 1) Name of the industry/organisation:
- 2) Address/communication details(incl email):
- 3) Contact person details:
 - a) Name:
 - b) Designation:
 - c) Email
 - d) Contact number/s:
- 4) Type:
Govt / PSU / Pvt /
Large scale / Medium scale / Small scale
- 5) Products/services offered by industry:
- 6) a) Whether willing to offer Industrial training facility during May/ June for Diploma in Engineering students: Yes / No.
b) If yes, whether you offer 6 weeks training : YES/NO
c) Internship capacity possible:

Programme	Civil Engg	Mechanical Engg	Electrical Engg		Total
Male					
Female					
Total					

- 7) Whether accommodation available for interns Yes / No.
If yes capacity: _____

- 8) Whether internship is charged or free:
If charged please specify amount per candidate: _____

Signature of responsible person:

Format2 : Obtaining Consent Letter from parents/guardians

(Undertaking from Parents)

To,

The Principal,

Subject: Consent for Industrial Training.

Sir/Madam,

I am fully aware that -

- i) My ward studying in _____ semester at your _____ institute has to undergo six weeks of Industrial training for partial fulfillment towards completion of Diploma in _____ Engineering.
- ii) For this fulfillment he/she has been deputed at _____ industry, located at _____ for internship of _____ weeks for the period from _____ to _____.

With respect to above I give my full consent for my ward to travel to and from the mentioned industry. Further I undertake that –

- a) My ward will undergo the training at his/her own cost and risk during training and/or stay.
- b) My ward will be entirely under the discipline of the organization where he/she will be placed and will abide by the rules and regulations in face of the said organization.
- c) My ward is NOT entitled to any leave during training period.
- d) My ward will submit regularly a prescribed weekly diary ,duly filled and countersigned by the training supervisor of the organization to the mentor faculty of the polytechnic.

I have explained the contents of the letter to my ward who has also promised to adhere strictly to the requirements. I assure that my ward will be properly instructed to take his own care to avoid any accidents/injuries in the industry. In case of any accident neither industry nor the institute will be held responsible.

Signature :

Name : _____

Address : _____

Phone Number: _____

Format 4: Issue Letter to the Industry/Organisation for the training alongwith details of students and mentors

To,

The HR Manager,

Subject: Placement for Industrial training of ____ weeks in your organization....

Reference: Your consent letter no:

Sir,

With reference to the above we are honored to place the following students from this institute for Industrial training in your esteemed organization as per the arrangement arrived at.

Diploma programme in _____ Engg.

Sr. no.	Enrolment no.	Name:	Mentor

Diploma programme in _____ Engg.

Sr. no.	Enrolment no.	Name:	Mentor

Kindly do the needful and oblige.

Thanking you in anticipation

Yours sincerely,

(Principal)

Name of the Institute:
with Seal

PA of Industrial training

Academic year : 20 -20

Name of the industry:

Sr. No	Enrolmen t Number	Name of student	Marks (5 marks for each week)						PA Marks by Industry Superviso r	PA based on Report by mentor faculty	Total
			Wee k 1	Wee k 2	Wee k 3	Wee k 4	Wee k 5	Tota l (A)	Out of 25 (B)	Out of 25 (C)	Out of 75 (A)+(B) +(C)

Marks for PA are to be awarded out of 5 for each week considering the level of completeness of activity observed, from the daily diary maintained and feedback from industry supervisor.

Name of mentor:

Signature of mentor

Program Name : Diploma in Information Technology/ Automobile Engineering / Digital Electronics / Medical Electronics / Plastic Engineering / Production Engineering / Fashion & Clothing Engineering / Electrical Engineering Group/ Instrumentation/ Instrumentation & Control

Program Code : IF/AE/DE/MU/IS/IC/PS/PG/PT/DC/EE/EP/EU

Semester : Fifth

Course Title : Entrepreneurship Development

Course Code : 22032

1. RATIONALE

Globalisation, liberalization and privatization along with revolution in information technology have opened up new opportunities transforming lives of masses. In this context, there is immense opportunity of establishing manufacturing, service, trading, marketing and consultancy enterprises by diploma engineer. Our fast growing economy provides ample scope for diploma engineers to succeed as an entrepreneur. Entrepreneurship requires distinct skill sets which are attempted to be developed through this course. To begin with, this course aims to develop the competency and the related outcomes in order to start small enterprises.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Develop project proposals to launch small scale enterprises.

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- Identify your entrepreneurial traits.
- Identify the business opportunities that suits you.
- Use the support systems to zero down to your business idea.
- Develop comprehensive business plans.
- Prepare plans to manage the enterprise effectively.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2	-	2	4	--	--	--	--	--	--	50@	20	50~	20	100	40	

(\$):Online Examination; (~):PA has two components under practical marks i.e. the assessment of practicals (seen in section 6) has a weightage of 60% (i.e.15 marks) and micro-project assessment (seen in section 12) and the remaining has a weightage 40% (i.e.10



marks) will be average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.

Legends: **L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit, **ESE** - End Semester Examination; **PA** - Progressive Assessment **\$**: Online examination.

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

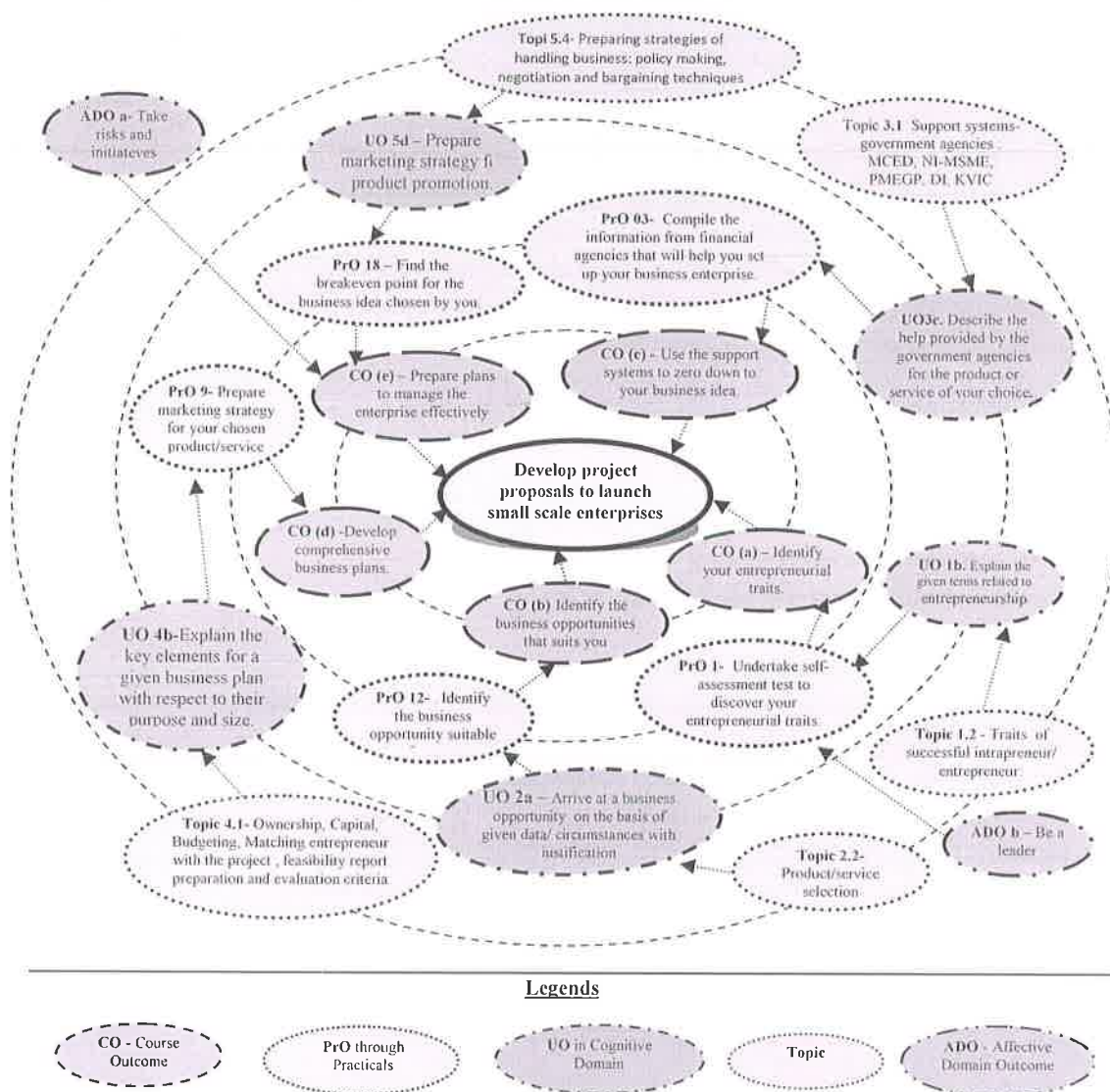


Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.



S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Submit a profile summary(about500words) of a successful entrepreneur indicating milestone achievements.	I	02*
2	Undertake SWOT analysis to arrive at your business idea of a product/service.	I	02
3	Generate business ideas(product/service) for intrapreneurial and entrepreneurial opportunities through brainstorming.	II	02*
4	Undertake self-assessment test to discover your entrepreneurial traits.	II	02
5	Identify the business opportunity suitable for you.	II	02
6	Arrange an exhibition cum sale of products prepared out of waste.	II	02
7	Survey industries of your stream, grade them according to the level of scale of production, investment, turnover, pollution to prepare a report on it.	II	02
8	Visit a bank/financial institution to enquire about various funding schemes for small scale enterprise.	III	02
9	Collect loan application forms of nationalise banks/other financial institutions.	III	02
10	Compile the information from financial agencies that will help you set up your business enterprise.	III	02*
11	Compile the information from the government agencies that will help you set up your business enterprise.	III	02
12	Prepare Technological feasibility report of a chosen product/service.	III	02
13	Prepare financial feasibility report of a chosen product/service.	III	02
14	Craft a vision statement and enabling mission statements for your chosen enterprise.	III	02
15	Prepare a set of short term,medium and long term goals for starting a chosen small scale enterprise	III	02
16	Prepare marketing strategy for your chosen product/service.	IV	02*
17	Compile information about various insurance schemes covering different risk factors.	IV	02
18	Organize a funfair of your class and write a report of profit/loss	V	02
19	Find the breakeven point for the business idea chosen by you.	V	02
20	Arrange a discussion session with your institute's pass out students who are successful entrepreneurs.	V	02
21	Prepare a business plan for your chosen small scale enterprise	V	02*
Total			42

Note:

- i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.



ii. The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

Sample Products that can be manufactured under SME

1. Badges cloth embroidered and metals
2. Bags of all types i.e. made of leather, cotton, canvas and jute etc. including kit bags, mail bags, sleeping bags and water-proof bag
3. Bandage cloth
4. Basket cane (Procurement can also be made from State Forest Corpn. and State Handicrafts Corporation)
5. Bath tubs of plastic
6. Battery Charger
7. Belt leather and straps
8. Bolts and Nuts
9. Boot Polish
10. Brooms
11. Domestic Brushes of different types
12. Buckets of all types of plastic
13. Button of all types
14. Chappals and sandals
15. Cleaning Powder
16. Cloth Covers for domestic use
17. Cloth Sponge
18. Coir mattress cushions and matting
19. Cotton Pouches
20. Curtains mosquito
21. Domestic Electric appliances as per BIS Specifications: Toaster Electric, Elect. Iron, Hot Plates, Elect. Mixer, Grinders Room heaters and convectors and ovens
22. Dust Bins of plastic
23. Dusters Cotton all types except the items required in Khadi
24. Electronic door bell
25. Emergency Light (Rechargeable type)
26. Hand drawn carts of all types
27. Hand gloves of all types
28. Hand numbering machine
29. Hand Pump
30. Hand Tools of all types
31. Handles wooden and bamboo (Procurement can also be made from State Forest Corpn. and State Handicrafts Corporation)
32. Haver Sacks
33. Honey
34. Invalid wheeled chairs.
35. Iron (dhobi)
36. Lamp holders
37. Letter Boxes
38. Nail Cutters
39. Oil Stoves (Wick stoves only)
40. Paper conversion products, paper bags, envelopes, Ice-cream cup, paper cup and saucers and paper Plates
41. Pickles, Chutney and Pappads
42. Pouches for various purposes



43. Safe meat and milk
44. Safety matches
45. Safety Pins (and other similar products like paper pins, staples pins etc.)
46. Shoe laces
47. Sign Boards painted
48. Soap Liquid
49. Spectacle frames
50. Steel Chair
51. Umbrellas
52. Utensils all types

Sample Services that can be offered under SME

1. Marketing Consultancy
2. Industrial Consultancy
3. Equipment Rental & Leasing
4. Typing Centres
5. Photocopying Centres (Zerowing)
6. Industrial photography
7. Industrial R & D Labs.
8. Industrial Testing Labs.
9. Desk Top publishing
10. Advertising Agencies
11. Internet Browsing/Setting up of Cyber Cafes
12. Auto Repair, services and garages
13. Documentary Films on themes like Family Planning, Social forestry, energy conservation and commercial advertising
14. Laboratories engaged in testing of raw materials, finished products
15. 'Servicing Industry' Undertakings engaged in maintenance, repair, testing or electronic/electrical equipment/ instruments i.e. measuring/control instruments servicing of all types of vehicles and machinery of any description including televisions, tape recorders, VCRs, Radios, Transformers, Motors, Watches.
16. Laundry and Dry Cleaning
17. X-Ray Clinic
18. Tailoring
19. Servicing of agriculture farm equipment e.g. Tractor, Pump, Rig, Boring Machines.
20. Weigh Bridge
21. Photographic Lab
22. Blue printing and enlargement of drawing/designs facilities
23. ISD/STD Booths
24. Teleprinter/Fax Services
25. Sub-contracting Exchanges (SCXs) established by Industry Associations.
26. Coloured or Black and White Studios equipped with processing laboratory.
27. Ropeways in hilly areas.
28. Installation and operation of Cable TV Network:
29. Operating EPABX under franchises
30. Beauty Parlours
31. Creches.

S. No.	Performance Indicators	Weightage in %
1	Leadership skills	20



S. No.	Performance Indicators	Weightage in %
2	Team work	20
3	Lateral/creative thinking	10
4	Observations and recording	10
5	Self learning	20
6	Answer the sample questions	10
7	Submission of report in time	10
Total		100

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- Follow safe practices
- Practice good housekeeping
- Practice energy conservation
- Demonstrate working as a leader/a team member
- Maintain tools and equipment
- Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Seminar Hall equipped with conference table, chairs and multimedia facilities	All
2	Modern desktop Computer with internet connection.	All

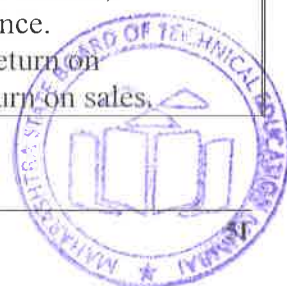
8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (In cognitive domain)	Topics and Sub-topics
Unit – I Entrepreneurship Development - Concept and Scope	1a. Describe the procedure to evaluate your entrepreneurial traits as a career option for the given product to be manufactured or services to be rendered.	1.1 Entrepreneurship as a career 1.2 Traits of successful intrapreneur/ entrepreneur: consistency, creativity, initiative, independent decision making, assertiveness, persuasion, persistence, information seeking.



Unit	Unit Outcomes (In cognitive domain)	Topics and Sub-topics
	1b. Explain the given terms related to Entrepreneurship 1c. Describe the salient features of the resources required for starting the specified enterprise. 1d. Identify the characteristics for a given type of enterprise.	handling business communication, commitment to work contract, calculated risk taking. 1.3 Entrepreneurship : scope in local and global market. 1.4 Intrapreneur and entrepreneur 1.5 Types of enterprises and their features : manufacturing, service and trading. 1.6 Steps in setting up of a business.
Unit – II Entrepreneurial Opportunities and selection process	2a. Arrive at a business opportunity on the basis of given data/circumstances with justification. 2b. Describe the scheme(s) offered by the government for starting the specified enterprise. 2c. Suggest a suitable place for setting up the specified enterprise on the basis of given data/circumstances with justification. 2d. Suggest the steps for the selection process of an enterprise for the specified product or service with justification. 2e. Describe the market study procedure of the specified enterprise.	2.1 Product/Service selection: Process, core competence, product/service life cycle, new product/ service development process, mortality curve, creativity and innovation in product/ service modification / development. 2.2 Process selection: Technology life cycle, forms and cost of transformation, factors affecting process selection, location for an industry, material handling. 2.3 Market study procedures: questionnaire design, sampling, market survey, data analysis 2.4 Getting information from concerned stakeholders such as Maharashtra Centre for Entrepreneurship Development[MCED], National Institute for Micro, Small and Medium Enterprises [NI-MSME], Prime Minister Employment Generation Program [PMEGP], Directorate of Industries[DI], Khadi Village Industries Commission[KVIC]
Unit – III Support Systems	3a. Describe the support system required for the specified enterprise. 3b. Describe the help provided by the government agencies for the specified product/service. 3c. Describe the help provided by the non-governmental agencies for the specified product/service. 3d. Compute the breakeven	3.1 Categorisation of MSME, ancillary industries 3.2 Support systems- government agencies: MCED, NI-MSME, PMEGP, DI, KVIC 3.3 Support agencies for entrepreneurship guidance, training, registration, technical consultation, technology transfer and quality control, marketing and finance. 3.4 Breakeven point, return on investment and return on sales.



Unit	Unit Outcomes (In cognitive domain)	Topics and Sub-topics
	point for the specified business enterprise, stating the assumptions made.	
UNIT IV Business Plan Preparation	4a. Justify the importance of the business plan for the given product/service. 4b. Explain the key elements for the given business plan with respect to their purpose/size 4c. Prepare the budget for the given venture. 4d. Prepare the details of the given component of the given startup business plan.	4.1 Sources of Product for Business : Feasibility study 4.2 Ownership, Capital, Budgeting, Matching entrepreneur with the project , feasibility report preparation and evaluation criteria 4.3 Business plan preparation
Unit –V Managing Enterprise	5a. Justify the USP of the given product/ service from marketing point of view. 5b. Formulate a business policy for the given product/service. 5c. Choose the relevant negotiation techniques for the given product/ service with justification. 5d. Identify the risks that you may encounter for the given type of business/enterprise with justification. 5e. Describe the role of the incubation centre for the given product/service.	5.1 Unique Selling Proposition [U.S.P.]: Identification, developing a marketing plan. 5.2 Preparing strategies of handling business: policy making, negotiation and bargaining techniques. 5.3 Risk Management: Planning for calculated risk taking, initiation with low cost projects, integrated futuristic planning, angel investors, venture capitalist. 5.4 Incubation centres: Role and procedure.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

9. SSUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Develop two products from household waste (attach photographs).
- Download product development and innovative films from internet.
- Prepare a collage for 'Traits of successful entrepreneurs'.
- Invite entrepreneurs, industry officials, bankers for interaction.
- Identify your hobbies and interests and convert them into business ideas.
- Convert your project work into business.



- g. Choose a product and design a unique selling proposition, brand name, logo, advertisement (print, radio, television), jingle, packing, packaging, label for it.
- h. Develop your own website. Share your strengths and weakness on it. Declare your time bound goals and monitor them on the website.
- i. Choose any advertisement and analyse its good and bad points.
- j. Decide any product and analyse its good and bad features.
- k. Select any product and prepare its cost sheet.
- l. Choose any product and study its supply chain.
- m. Arrange brainstorming sessions for improvement of any product.
- n. Study schemes for entrepreneurship promotion of any bank.
- o. Visit industrial exhibitions, trade fairs and observe nitty-gritty of business.
- p. Open a savings account and build your own capital.
- q. Organise industrial visit and suggest modifications for process improvement.
- r. Interview at least four entrepreneurs or businessman and identify Charms of entrepreneurship and Traits of successful entrepreneurs.
- s. Analyse case studies of any two successful entrepreneurs.
- t. Perform a survey and identify local resources available for setting up of an enterprise.
- u. Engage in marketing of products.
- v. Carry out a demand supply gap analysis for a particular product.
- w. Organise a prototype development competition.
- x. Arrange fairs, events in the institute and try for sponsorships.
- y. Select any performance criteria and continuously compete with yourself.
- z. On any performance criteria continuously compete with others.
- aa. Foresee your dream and make a long term plan for its accomplishment.
- bb. Dream for something unique and make a write-up.
- cc. Read articles, books on creativity.
- dd. Using morphological analysis technique, reduce cost or increase quality of a product.
- ee. Conduct a market survey for a project. Collect data on machinery specifications, price, output/hr, power consumption, manpower requirement, wages, raw material requirement, specification, price, competitor's product price, features, dealer commissions, marketing mix.
- ff. Prepare a business plan and organize a business plan competition.
- gg. Select a social cause, set objectives, plan and work for its accomplishment.
- hh. Videograph as many as possible from the above and upload on your website, YouTube, facebook.

10. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- a. Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- b. '**L**' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- c. About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs/UOs through classroom presentations (see implementation guideline for details).
- d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
- e. Use Flash/Animations to explain various maintenances techniques.



- f. Guide student(s) in undertaking micro-projects.
- g. Instructors should emphasise more on deductive learning. Students should learn to recognise, create, shape opportunities, and lead teams for providing economic-social value to society.
- h. Business simulations should be used to enhance behavioural traits of successful intrapreneurs and entrepreneurs amongst students. Emphasis should be on creating entrepreneurial society rather than only setting up of enterprise.
- i. They must be encouraged to surf on net and collect as much information as possible.
- j. Each student should complete minimum twenty activities from the suggested list. Minimum possible guidance should be given for the suggested activities.
- k. Students should be promoted to use creative ideas, pool their own resources, finish their presentation, communication and team skills.
- l. Alumni should be frequently invited for experience sharing, guiding and rewarding students.
- m. Display must be arranged for models, collages, business plans and other contributions so that they motivate others.

11. SUGGESTED MICRO-PROJECTS

One Business Plan as a micro-project is planned to be undertaken by a student assigned to him/her in the beginning of the semester. S/he should submit it by the end of the semester to develop the industry oriented COs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation in the middle of the semester and one at the end of the semester before submission of the project proposal incorporating the concepts taught during semester. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course.

12. SUGGESTED LEARNING RESOURCES

S. No.	Title of Books	Author	Publication
1	The Entrepreneurial Instinct : How Everyone Has the Innate Ability to Start a Successful Small Business	Mehta, Monica	McGraw-Hill Education, New Delhi, 2012, ISBN 978-0-07-179742-9
2	Entrepreneurship	Hisrich, R. D.	McGraw-Hill Education, New Delhi, 2013 ISBN-13: 978-1259001635
3	Part I Readings in Entrepreneurship Education	Sareen, S.B.	Entrepreneurship Development Institute of India (EDI), GOI, Ahmedabad, 2016; ISBN: 978-0078029196 ..
4	Reading Material of Entrepreneurship Awareness Camp	Gujral, Raman	Entrepreneurship Development Institute of India (EDI), GOI, 2016 Ahmedabad,
5	Product Design and Manufacturing	Chitale, A K	PHI Learning, New Delhi, 2014; ISBN: 9788120348738
6	Entrepreneurship Development Small Business Entrepreneurship	Charantimath, Poornima	Pearson Education India, New Delhi; ISBN: 9788131762264
7	Entrepreneurship Development: Special edition for MSBTE	CPSC, Manila	Tata Mc-Graw Hill, New Delhi
8	Entrepreneurship and Small	Khanka, S.S.	S.Chand and Sons, New Delhi,



S. No.	Title of Books	Author	Publication
	Business Management		ISBN: 978-93-5161-094-6
9	Entrepreneurship Development	S, Anil Kumar	New Age International, New Delhi, ISBN: 9788122414349

13. SUGGESTED SOFTWARE/LEARNING WEBSITES

1	MCED Books links	http://www.mced.nic.in/UdyojakSpecial.aspx?linktype=Udyojak
2	MCED Product and Plan Details	http://www.mced.nic.in/allproduct.aspx
3	The National Institute for Entrepreneurship and Small Business Development Publications	http://niesbud.nic.in/Publication.html
4	Courses : The National Institute for Entrepreneurship and Small Business Development	http://niesbud.nic.in/docs/1standardized.pdf
5	Entrepreneur.com	https://www.entrepreneur.com/lists
6	GOVT. SPONSORED SCHEMES	https://www.nabard.org/content1.aspx?id=23andcatid=23andmid=530
7	NABARD - Information Centre	https://www.nabard.org/Tenders.aspx?cid=501andid=24
8	NABARD – What we Do	http://www.nabard.org/content1.aspx?id=8andcatid=8andmid=488
9	Market Review	http://www.businessstoday.in/markets
10	Start Up India	http://www.startupindia.gov.in/pdf/file.php?title=Startup%20India%20Action%20Planandtype=Actionandq=Action%20Plan.pdfandcontent_type=Actionandsubmenupoint=action
11	About - Entrepreneurship Development Institute of India (EDII)	http://www.ediindia.org/institute.html
12	EDII - Centres	http://www.ediindia.org/centres.html
13	EDII - Publications	http://www.ediindia.org/publication.html
14	Business Plans: A Step-by-Step Guide	https://www.entrepreneur.com/article/247574
15	The National Science and Technology Entrepreneurship Development Board (NSTEDB)	http://www.nstedb.com/index.htm
16	NSTEDB - Training	http://www.nstedb.com/training/training.htm
17	Tata Exposures	http://www.tatasocial-in.com/project-exposure
18	Ministry Of Micro, Small And Medium Enterprises	http://www.dcsmse.gov.in/schemes/TEQUPDetail.htm
19	List of Business Ideas for Small Scale Industry	https://smallb.sidbi.in/%20/thinking-starting-business/big-list-business-ideas-small-business
20	Thinking of Entrepreneurship	https://smallb.sidbi.in/entrepreneurship-stage/thinking-entrepreneurship
21	List of services for Small Scale Industry	http://www.archive.india.gov.in/business/Industry_services/illustrative.php
22	NSIC Schemes and Services	http://www.nsic.co.in/SCHSERV.ASP



Program Name : All Branches of Diploma in Engineering and Technology.
Program Code : CE/CR/CS/CH/CM/CO/IF/CW/DE/EJ/EN/EQ/ET/EX/IE/
MU/EE/EP/EU/IS/IC/AE/FG/ME/PG/PT/DC/TX/TC
Semester : Fifth
Course Title : Capstone Project – Planning
Course Code : 22058

1. RATIONALE

According to the requirement of National Board of Accreditation (NBA), 'learning to learn' is an important Graduate Attribute (GA No.11). It is required to develop this skill in the students so that they continue to acquire on their own new knowledge and skills from different 'on the job experiences' during their career in industry. An educational 'project' just does that and may be defined as *'a purposeful student activity, planned, designed and performed by a student or group of students to solve/ complete the identified problem/task, which require students to integrate the various skills acquired over a period to accomplish higher level cognitive and affective domain outcomes and sometimes the psychomotor domain outcomes as well'*. Projects mainly serve this purpose of developing learning-to-learn skills with an aim to develop the following attributes in the students:

- Initiative, confidence and ability to tackle new problems
- Spirit of enquiry
- Creativity and innovativeness
- Planning and decision making skills
- Ability to work in a team and to lead a team
- Ability of self directed learning which is required for lifelong learning
- Persistence (habit of not giving up quickly and trying different solutions in case of momentary failures, till success is achieved)
- Resourcefulness
- Habit of keeping proper records of events and to present a formal comprehensive report of their work.

2. COMPETENCY

The course should be taught and implemented with the aim to develop the required course outcomes (COs) so that students will acquire following competency needed by the industry:

- Plan innovative/creative solutions independently and/or collaboratively to integrate various competencies acquired during the semesters to solve/complete the identified problems/task/shortcomings faced by industry/user related to the concerned occupation.**

3. COURSE OUTCOMES (COs)

The following could be some of the major course outcomes depending upon the nature of the projects undertaken. However, in case of some projects few of the following course outcomes may not be applicable.

- Write the problem/task specification in existing systems related to the occupation.
- Select, collect and use required information/knowledge to solve the problem/complete the task.
- Logically choose relevant possible solution(s).
- Consider the ethical issues related to the project (if there are any).
- Assess the impact of the project on society (if there is any).
- Prepare 'project proposals' with action plan and time duration scientifically before beginning of project.



- g) Communicate effectively and confidently as a member and leader of team.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
-	-	2	2	-	-	-	-	-	-	25@	10	25	10	50	20	

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit, ESE - End Semester Examination; PA - Progressive Assessment

5. Capstones Project

One of the dictionary meaning is the ‘crown’ or the stone placed on top of the building structure like ‘kalash on top of Temples and Mosques’ or ‘Cross on top of churches’. Capstone projects are culminating experiences in which students synthesize the competencies acquired over whole programme. In some cases they also integrate cross-disciplinary knowledge. Thus Capstone projects prepare students for entry into a career and can be described as a ‘rite of passage’ or ‘minimal threshold’ through which participants change their status from student to graduate. A capstone project therefore should serve as a synthesis — reflection and integration— to bridge the real-world preparatory experience to real life. Thus capstone project should have emphasis on integration, experiential learning, and real-world problem solving and hence these projects are very important for students. To develop the highly essential industry oriented skills and competencies in the students, the capstone projects are offered in the last two semesters to serve for following purposes:

- Integrate the competencies acquired by the students in the previous and current semesters.
- Provide opportunities for interdisciplinary work in tackling problems likely to be faced by them in industry which are exciting and challenging.

6. Capstone Project Planning

Students are supposed to find out a suitable project and prepare a detailed plan in fifth semester so that it can be executed smoothly in sixth semester. The main characteristic of any project whether small or big is that it requires simultaneous application of various types of skills in the different domains of learning. Moreover, project normally do not have a predefined single solution, in other words for the same problem different students may come up with different but acceptable solutions. Further, in the process of arriving at a particular solution, the student must be required to make a number of decisions after scrutiny of the information s/he has accumulated from experiments, analysis, survey and other sources.

The projects will have a detailed project proposal, which must be executed or implemented within the time allocated, simultaneously maintaining a logbook periodically monitored by the teacher. A detailed project report is to be prepared as project progresses, which has to be submitted after the project is over. For self assessment and reflection students have to also prepare a portfolio of learning.

During the guidance and supervision of the project work, teachers’ should ensure that students acquire following **learning outcomes** (depending upon the nature of the project work some of these learning outcomes may not be applicable):

- Show the attitude of enquiry.
- Identify the problems in the area related to their programme.
- Identify the information suggesting the cause of the problem and possible solutions.
- Assess the feasibility of different solutions and the financial implications.



- e) Collect relevant data from different sources (books/internet/market/suppliers/experts etc. through surveys/interviews).
- f) Prepare required drawings and detailed plan for execution of the work.
- g) Work persistently and participate effectively in group work to achieve the targets.
- h) Work independently for the individual responsibility undertaken.
- i) Ask for help from others including guide, when required.
- j) Prepare portfolio to reflect (*chintan-manan*) on experiences during project work.
- k) Prepare seminar presentations to present findings/features of the project.
- l) Confidently answer the questions asked about the project.
- m) Acknowledge the help rendered by others in success of the project.

If students are able to acquire these *learning outcomes*, then they would be able to acquire the COs as discussed in section 3.

7. Scopes of Projects

Scope of the project work should be decided based on following criteria:

- a) **Relation to diploma programme curriculum:** When students intend to select topics for the project work they need to choose a project which relates well to their curriculum (It may be beyond curriculum, but it should relate to it) and requires implementation of theories already learnt and skills already possessed by them from the previous semesters.
- b) **Abilities possessed by the group of students:** Projects should be chosen so that it can be completed mainly using students' problem solving capabilities and depth of learning. It is natural that highly motivated students or high achievers may come out with projects which are more complex and challenging. Teachers should guide students to choose challenging projects according to the students' ability.
- c) **Resources Available:** Students and Guides should keep in mind the availability of resources while deciding the topic and the scope of the project. Some of the important resources which need consideration are:
 - i. Time available
 - ii. Raw Material/Components required
 - iii. Manufacturing/Fabrication equipment and tools required
 - iv. Testing/Measuring equipment and instruments required
 - v. Access to Journals (Library/Digital)
 - vi. Expertise for theoretical guidance (available in polytechnic, nearby institutes or nearby industries)
 - vii. Expertise and technology required for fabrication (if required)
 - viii. Software required.

An important aspect to be considered is to decide who will choose a project. The best practice is that teacher should guide students about the above factors to be considered for choosing the project and based on these factors students should do the ground work and identify the possible projects and teachers should work as only facilitator and Guide in final selection of the project title and its scope.

d) Suggested Type of Capstone Projects

In general, the projects that the students can take up could be of the following types;

- i. Feasibility studies.
- ii. Design projects
- iii. Market surveys about raw material, components or finished products.
- iv. Prototype (design, make, test and evaluate).
- v. Advanced experimental work requiring the development of existing equipment to be used and developed.
- vi. Field works: This could include surveys, using equipment, charting data and information from visual observation.



- vii. Comparative Studies: Theoretical study of two systems/mechanisms/ processes in detail and comparing them on the basis of cost/energy conservation/impact on environment/technology used etc.
- viii. Application of Emerging technology: Theoretical study of some emerging technology and feasibility of its application in some real life situation in detail.
- ix. Fabrication of some equipment/machine etc.
- x. Construction of some structure.
- xi. Development of software or use of software for solving some broad-based problem.

8. GUIDELINES FOR UNDERTAKING A PROJECT

The selection of the *Capstone Project title* must have emphasis to the Elective courses/ Elective Group taken for the study and exam for 5th and 6th semester. The students will then work on the identified problem/task through a rigorous process of understanding and analyzing the problem, conducting a literature search, deriving, discussing (monitored by the guide every fortnight) and designing the *Semester V 'Project Proposal'* with the following sub-titles:

- a) Rationale (one page)
- b) Introduction
- c) Literature Survey
- d) Problem Definition
- e) Proposed Methodology of solving Identified problem
- f) In-case some prototype has to be fabricated then its tentative design and procedure for making it should be part of the proposal.
- g) Resources and consumables required.
- h) Action Plan (sequential list of activities with probable dates of completion)

As soon as the 'Project Proposal' is approved by the teacher, the student will begin to maintain a dated '*Project Logbook*' for the whole semester. This is a sort of a 'weekly diary' indicating all the activities conducted by the student every week in the semester to complete the project. This '*project logbook*' should be got signed by the teacher at regular intervals for progressive assessment to match the project proposal. If this is maintained sincerely and truthfully by the student, it will be very helpful in compiling the 'Project Report' at the end of the semester by him/her.

9. PORTFOLIO FOR SELF-DIRECTED LEARNING

To ensure that students acquire these outcomes, students should also be guided to prepare a '*Portfolio*', so that they may reflect on their weaknesses/mistakes and learn from them. *Students should also be encouraged to discuss with their guide and record not only technical problems but also problems related to group work, planning, execution, leadership in the team etc., so that students can also identify their weaknesses in affective domain and take remedial actions to overcome the same.* If they wish, the students can also show their portfolio to their teachers (whom they trust) for obtaining teachers' comments on their reflection for pointing out their mistakes so that they can improve their performance.

'*Portfolio*' is the record of the reflection (thinking or *chintan-manan*) on experiences to which students undergo during the different stages of the project. In a portfolio, students record their critical experiences and reflect (think or do *chintan-manan*) on them in writing. This process of reflecting on the experiences make them learn from their mistakes and build on their strengths. To help students in reflection, a Portfolio format with reflective prompts (simple thought provoking questions) for different stages of the project is given as annexure B.

12.1 Purposes of Portfolio Preparation



Reflection by self is important since group work is so complex that it is difficult for teachers to appreciate the real problems amongst the students. In a portfolio, prompts (simple thought provoking questions) are given to trigger reflection on different aspects of project work. Prompts help the students to ask questions from themselves regarding different aspects of the project work and interpersonal relationships. Process of answering these questions forces students to think about behavioral problems and possible remedies/solution to deal with those problems. Portfolio preparation therefore helps in reflection on building the strengths and elimination of the weaknesses of the students pertaining to following qualities which the industry also need.

- a) Plan properly for execution of given work.
- b) Take appropriate decisions.
- c) Arrange resources.
- d) Work as member and leader of team.
- e) Communicate properly.
- f) Resolve the conflicts.
- g) Manage the time well.
- h) Have concern for ethical, societal and environmental issues.
- i) Learn-to-learn from experiences.

It may be seen that these qualities are not directly related with the theoretical subject knowledge and can be developed only through real life experiences. Project work is one such type of experience where opportunity is available to develop all these qualities.

However, even during project work, emphasis of most of the students and teachers remains on development of the technical knowledge and skills while development of above qualities is neglected. Students can develop these qualities if they reflect (do thinking or *Chintan-Manan*) on their experiences from the point of view of these qualities and find out their own weaknesses and strengths. Because if somebody wants to improve his/her abilities then first step for that person is to have self awareness about his/her weaknesses and strengths.

Though portfolio preparation requires considerable time, it is essential, if we want to learn from the experiences and develop these qualities. Writing down reflections helps in better reflection as it is well known that when a person starts writing something he/she becomes more cautious about his/her view and evaluate those views before writing. Thus process of writing improves the quality of reflection or thinking. Moreover, if reflections on different stages of work are written down, over a period of time a large amount of reflection can be generated, and if this reflection is looked back, it may help in identifying some pattern of behaviour in individual which may be improved or rectified latter on as per requirement.

12.2 Guidelines for Portfolio Preparation and assessment

The main purpose of portfolio preparation is learning based on self-assessment and ***portfolio is not to be used for assessment in traditional sense.***

- a) Each student has to prepare his/her portfolio separately. However, he/she can discuss with the group members about certain issues on which he/she wants to write in the portfolio.
- b) For fifth semester and sixth semester, there will be only one portfolio but it will have two separate parts, first part for project planning (having two sections A and B) second part for project execution. (having two sections C and D)
- c) Whatever is written inside the ***portfolio is never to be used for assessment***, because if teachers start giving marks based on whatever is written in the portfolio, then students would hesitate in true self-assessment and would not openly describe their own mistakes or shortcomings.



- d) Some marks are allocated for portfolio, these marks are to be given based on how sincerely portfolio has been prepared and not based on what strengths and weaknesses of the students are mentioned in the portfolio.
- e) Portfolio has to be returned back to the students after assessing it (assessment is only to see that whether portfolio is completed properly or not) by teachers. Because student is the real owner of the portfolio.
- f) Students mainly learn during portfolio preparation, but they can further learn if they read it after a gap. And hence they are supposed to keep the portfolios with them even after completion of the diploma because it is record of their own experiences (it is like diary some people write about their personal experiences), because they can read it again after some time and can revise their learning (about their own qualities)

Even after completion of Diploma programme, students can continue to prepare portfolio related to different experiences in their professional and personal life and by refereeing back to old portfolios after a gap of some years, they can learn that how their personality has evolved over the years. They can also see a pattern of behaviour in their own personality which may be source of their weaknesses or strengths and they can take remedial measures based on this study of their portfolios.

Note

Since some sections of the portfolio are related with interpersonal relationships and student may find it difficult to write these experiences in English. Language should not be the barrier in reflection and hence students should be allowed to prepare the portfolio in their preferred language such as *Marathi* or *Hindi* if they find it difficult to write in English.

The amount and type of mistakes identified by students would not affect the marks received by the students. The total 7 Marks allocated for portfolio (4 marks for PA and 3 for ESE) are only for proper completion of the portfolio.

10. PROJECT REPORT

At the end of fifth Semester, the student will prepare a Semester V 'Project Report' with the following sub-titles:

- Certificate (in the Format given in this document as annexure A)
- Acknowledgements
- Abstract (in one paragraph not more than 150 words)
- Content Page
- Chapter-1 Introduction and background of the Industry or User based Problem
- Chapter-2 Literature Survey for Problem Identification and Specification,
- Chapter-3 Proposed Detailed Methodology of solving the identified problem with action plan
- References and Bibliography

Note: The report should contain relevant diagrams and figures, charts.

11. ASSESSMENT OF CAPSTONE PROJECT – PLANNING

Like other courses, assessment of Project work also has two components, first is progressive assessment, while another is end of the term assessment. The mentor faculty will undertake the progressive assessment to develop the COs in the students. They can give oral informal feedback about their performance and their interpersonal behaviour while guiding them on their project work every week. The following characteristics/ qualities informally or formally should be considered during different phases of the project work which will be assessed thrice as discussed in sub-section.

(A) Initial Phase

- i. **Definition of the Problem**
 - a) Accuracy or specificity



- b) Appropriateness with reference to desired course outcomes.
- ii. **Methodology of Conduction the Project**
 - a) Appropriateness
 - b) Flexibility
 - c) Clarity
- iii. **General Behaviour**
 - a) Initiative
 - b) Resourcefulness
 - c) Reasoning ability
 - d) Imagination/creativity
 - e) Self-reliance

(B) Intermediate Phase

- i. **Performance of Student**
 - a) Ability to follow correct procedure
 - b) Manipulative skills
 - c) Ability to collect relevant information
 - d) Ability to observe, record & interpret
 - e) Ingenuity in the use of material and equipment
 - f) Target achievement
- ii. **General Behaviour**
 - a) Persistence
 - b) Interest
 - c) Commitment
 - d) Confidence
 - e) Problem solving ability
 - f) Decision making ability
 - g) Initiative to act
 - h) Team spirit.
 - i) Sharing of material etc.
 - j) Participation in discussion
 - k) Completion of individual responsibilities

(C) Final Phase

- i. **Quality of Product**
 - a) Dimensions
 - b) Shape
 - c) Tolerance limits
 - d) Cost effectiveness
 - e) Marketability
 - f) Modernity
- ii. **Quality of Report**
 - a) Clarity in presentation and organization
 - b) Styles and language
 - c) Quality of diagrams, drawings and graphs
 - d) Accuracy of conclusion drawn
 - e) Citing of cross references
 - f) Suggestion for further research/project work
- iii. **Quality of presentation**
 - a) Understanding of concepts, design, methodology, results, implications etc
 - b) Communication skills
 - c) Ability to draw conclusions and generalization



12. PROGRESSIVE ASSESSMENT (PA) GUIDELINES

15 Marks are allocated for the formal progressive assessment. However, following points need consideration during the three times of formal progressive assessment of the students at the end of 4th, 12th and 14th week.

- Fortnightly monitoring** by the mentoring teachers is necessary and marks given progressively (even the gradual chapter preparation) so that that students will not copy earlier reports or get things done or reports from the market. The **students should not be awarded marks** if they have not done on their own.
- For progressive assessment at the end of 14th week, students should be asked to give the power point presentation before group of teachers and junior students (so that junior students may also get awareness about the capstone project work they have to carry out in future).
- Although marks for *portfolio preparation* is to be given at the end of 14th week, students should be asked to bring their partly prepared portfolio (relevant sections prepared) also during their assessment at the end of 4th week and 12th week.
- Marks for portfolio preparation should be based only on proper preparation of portfolio by writing answers to most of the prompts (self-questions to students) in the portfolio. These marks should not be based on the mistakes indicated by students in their working (while answering the prompts) and corrective actions taken by them.
- The students would be awarded marks for their efforts (In some cases it may happen that due to some reasons such as unavailability of some material or component or some other resources, students may not be able to complete the project, but they have tried their best, in such cases students would be given appropriate marks if they have done enough efforts.)
- Originality of the report** (written in own words) would be given more importance rather than use of glossy paper or multi-colour printing.

12.1 Progressive Assessment (PA) Criteria

Allocation Criteria of the **25 marks** are for the Progressive Assessment (PA).

S. No.	Criteria	Marks
First Progressive Assessment at the end of 4th week		
1	Problem Identification/Project Title (Innovation /Utility of the Project for industry/ User/Academia) marks to be also given based on (i) Accuracy or specificity of the scope and (ii) Appropriateness of the work with reference to desired course outcomes.	02
2	Industrial Survey and Literature Review: marks to be given based on extent/volume and quality of the survey of Industry / Society / Institutes/Literature/Internet for Problem Identification and possible solutions	02
3	General Behaviour: initiative, resourcefulness, reasoning ability, imagination/creativity, self-reliance to be assessed Note: Oral feedback on general behaviour may also be given whenever relevant/ required during day to day guidance and supervision. Only written feed-back/suggestions	00
Second Progressive Assessment at the end of 12th week		
4	Project Proposal: Marks to be given also based on appropriateness, flexibility, detail and clarity in methods/planning. (In case of working models, detailed design and planning of fabrication/assembly of the prototype has to be also assessed). This proposal should include whole project including work to be done in sixth semester	03



S. No.	Criteria	Marks
5	Execution of Plan in fifth semester (Since project is to be fully completed in sixth semester, the part of the project which is planned to be completed in fifth semester is only to be evaluated: marks to be also given based on ability to collect relevant information, ability to follow correct procedure, manipulative skills, ability to observe, record & interpret, ingenuity in the use of material and equipment, target achievement) In case of working models, quality of workman ship (including accuracy in dimensions, shape, tolerance limits), appropriateness of raw materials/components/ technology being used, functioning of the prototype, cost effectiveness, marketability, modernity etc. has to be also assessed.	02
6	Log book (for work done in fifth semester, detailed and regular entry would be basis of marks)	02
7	General Behaviour (persistence, interest, confidence, problem solving ability, decision making ability, initiative to act, team spirit, sharing of material etc., participation in discussions, completion of individual responsibilities, leadership) Note: Oral feedback on general behaviour should also be given whenever relevant/ required during day to day guidance and supervision. Only written feed-back./suggestions	00
Third Progressive Assessment at the end of 14th week		
8	Portfolio for Self learning and reflection (marks based on amount of reflection and completion of the portfolio for work done in fifth semester)	04
9	Final Report writing including documentation. (marks based on: clarity in presentation and organization; styles and language; quality of diagrams, drawings and graphs; accuracy of conclusion drawn; citing of cross references; suggestion for further research/project work) Report has to be prepared for work done in fifth semester and planning for sixth semester work.	06
10	Presentation (presentation skills including communication skills to be assessed by observing quality of presentations and asking questions during presentation and viva/voce) Report has to be prepared for work done in fifth semester and plan for sixth semester.	02
11	Defence (ability to defend the methods/materials used and technical knowledge, and involvement of individual to be assessed by asking questions during presentation and viva/voce)	02
Total		25

13. END-SEMESTER-EXAMINATION (ESE) ASSESMENT GUIDELINES

The **remaining 25 marks** are for the end-semester-examination (ESE). And marks would be given according to following criteria. Moreover, the suggested evaluation scheme can be changed slightly by the external faculty according to nature of problem / project following University guidelines..

- For each project, the one or two students from the concerned group of students should be asked to present the power point presentation before the external and internal (for about 10 minutes) and then external should ask the questions from each member of the group separately to ascertain the contribution made by each student.
- The students would be awarded marks for their efforts (In some cases it may happen that due to some reasons such as unavailability of some material or component or some other resources, students may not be able to complete the project, but they have tried their best, in such cases students would be given appropriate marks commensurate with their efforts.)



- c) The students would not be awarded marks if they have completed the project by getting done the work from market or some professionals (taking help and guidance is different as compared to getting the work or maximum part of the work completed from others on payment basis).
- d) Originality of the report (written in own words, even if there are grammatical and spelling mistakes) would be given more importance rather than quality of printing and use of glossy paper (and preparing report by copy pasting from other reports).

Note: It is very common that people are not able to complete the project in time despite best of their efforts. (Please recall that how many times people are able to complete in time, personal projects such as building own house or professional projects such as developing the lab in the institute). So if students have put in enough genuine efforts but could not complete the project in time then we should consider it sympathetically and they should be given marks based on their efforts and they should get more marks as compared to students who have got their projects completed by taking major help from others/market.

13.1 End-Semester-Examination (ESE) Assessment Criteria.

Allocation Criteria of the **25 marks** are for the end-semester-examination (ESE)

S. No.	Description	Marks
1	Problem Identification/Project Title (innovation /utility of the project for industry/ user/academia) marks to be also given based on (i) accuracy or specificity of the scope and (ii) appropriateness of the work with reference to desired course outcomes.	02
2	Industrial Survey and Literature Review (marks to be given based on extent/volume and quality of the survey of industry / society / institutes/literature/internet for problem identification and possible solutions)	02
3	Project Proposal: Marks to be given also based on appropriateness, flexibility, detail and clarity in methods/planning. (In case of working models, detailed design and planning of fabrication/assembly of the prototype has to be also assessed). This proposal should include whole project including work to be done in sixth semester.	02
4	Execution of Plan in fifth semester (Since project is to be fully completed in sixth semester, the part of the project which is planned to be completed in fifth semester is only to be evaluated: marks to be also given based on ability to collect relevant information, ability to follow correct procedure, manipulative skills, ability to observe, record & interpret, ingenuity in the use of material and equipment, target achievement) In case of working models, quality of workman ship (including accuracy in dimensions, shape, tolerance limits), appropriateness of raw materials/components/ technology being used, functioning of the prototype, cost effectiveness, marketability, modernity etc. has to be also assessed.	02
5	Log book (for work during fifth semester, marks to be given based on detailed and regular entry)	03
6	Portfolio for Self learning and reflection (for work during fifth semester) Marks based on amount of reflection and completion of portfolio.	03
7	Project Report including Documentation (for work during fifth semester and planning for sixth semester) (marks based on: clarity in	04



S. No.	Description	Marks
	presentation and organization; styles and language; quality of diagrams, drawings and graphs; accuracy of conclusion drawn; citing of cross references; suggestion for further research/project work)	
8	Presentation (presentation skills including communication skills to be assessed by observing the quality of presentations and asking questions during presentation and viva/voce) Presentation should be based on work done in fifth semester and planning for sixth semester.	03
9	Defence (ability to defend the methods/materials used and technical knowledge, and involvement of individual to be assessed by asking questions during presentation and viva/voce)	04
Total		25

14. SPECIAL TEACHING STRATEGIES (If any)

- Teacher's should not spoon feed the students and let them try on their own at different stages of the project work and even first let them strive hard and only when efforts of students have failed, then teacher should guide them. Guidance should be in initially in the form of clues or hints rather than complete explanation, detailed explanation should be given only when students are not able to work based on clues/hints. The role of teacher should be limited to guide and facilitator
- Teachers should guide students in selecting a topic which is relevant and challenging (but within capacity) for students according to their abilities.
- Teachers should ensure that students prepare the project plan in as much detail as possible, since this way only they would learn the importance of planning and how to do the detail planning. Teachers should allow students to proceed ahead only when they have detailed plan with them.
- Teachers should motivate students to maintain log book and prepare portfolio. They should explain benefits of these activities to students and also train them in these activities, because most of them may be doing this first time.
- Teachers should also encourage students to openly discuss their weaknesses and shortcomings in portfolio and teachers should develop confidence in students that admitting mistakes and weaknesses helps in improving them and their marks would not be affected by revealing their mistakes. Marks related to portfolio are awarded based only on the sincerity with which it is prepared and not based on strengths and weaknesses of students.
- Teachers should continuously discuss with students about working of group and progress in the project and from this discussion should identify their personal qualities (both strengths and weaknesses) and suggest to them ways for improving those qualities.
- Internal as well as external examiners should reward students for original work and efforts of students even if they are not fully successful or not able to complete the project in comparison to those students who have taken paid help from others to complete their project.



Annexure A**CERTIFICATE**

This is to certify that Mr./Ms.....

FromCollege having Enrolment No:

has completed **Report on the Problem Definition/ Semester V Project Report/ Final Project**

Report having title

individually/ in a group consisting of..... persons under the guidance of the Faculty Guide.

.....
The mentor from the industry for the project

Name:

Telephone:.....

Annexure B**Portfolio for Self Directed Learning for Major Project Work**

Name of Student:.....

Semester:.....**Programme/Branch:**.....

Roll Number:.....

Title of the Project:.....

Name and Designation of Project Guide:.....

Name of Polytechnic:.....

Part A: Selecting the Project and Team (Answers to the following questions to be included in 'Portfolio' as Reflection related to formation of group and finalization of project topic).

Note: This section has to be prepared just after the finalization of the Project topic and formation of the Project Team .

1. How many alternatives we thought before finalizing the project topic?
2. Did we consider all the technical fields related to branch of our diploma programme?
3. Why we found present project topic as most appropriate?
4. Whether all the group members agreed on the present project topic? If not? What were the reasons of their disagreements?
5. Whether the procedure followed in assessing alternatives and finalizing the project topic was correct? If not, discuss the reasons.
6. What were the limitations in other alternatives of project topic?
7. How we formed our team?
8. Whether we faced any problem in forming the team? If yes, then what was the problem and how was it resolved?



9. Am I the leader of our project team? If yes, then why was I chosen? If not, why I could not become the project team leader?
10. Do I feel that present team leader is the best choice available in the group? If yes, then why? If not, then why?
11. According to me who should be the leader of the team and why?
12. Can we achieve the targets set in the project work within the time and cost limits?
13. What are my significant good/ bad sharable experiences while working with my team which provoked me to think? What I learned from these experiences?
14. Any other reflection which I would like to write about formation of team and finalization of project title, if any?

Part B: Reflection related to project planning (Answers to the following questions to be included in 'Portfolio' as reflection on planning)

Note: This section has to be prepared just after the finalization of the 'Project Proposal'.

1. Which activities are having maximum risk and uncertainty in our project plan?
2. What are most important activities in our project plan?
3. Is work distribution is equal for all project group members? If not? What are the reasons? How we can improve work distribution?
4. Is it possible to complete the project in given time? If not what are the reasons for it? How can we ensure that project is completed within time.
5. What extra precaution and care should be taken in executing the activities of high risk and uncertainty? If possible, how such risks and uncertainties can be reduced?
6. Can we reduce the total cost associated with the project? If yes, then describe the ways?
7. For which activities of our project plan, arrangement of resources is not easy and convenient?
8. Did we make enough provisions of extra time/expenditure etc. to carry out such activities?
9. Did we make enough provisions for time delays in our project activity? In which activities there are more chances of delay?
10. In our project schedule, which are the days of more expenditure? What provisions we have made for availability and management of cash?
11. Any other reflection which I would like to write about project planning?



Teacher Evaluation Sheet (ESE) for Capstone Project Planning

Name of Student:

Name of Programme..... Semester:

Course Title and Code:.....

Title of the Capstone Project:

A. POs addressed by the Capstone Project (Mention only those predominant POs)

- a)
- b)
- c)
- d)

B. COs addressed by the Capstone Project (Mention only those predominant POs)

- a)
- b)
- c)
- d)

C. OTHER LEARNING OUTCOMES ACHIEVED THROUGH THIS PROJECT

a) Unit Outcomes (Cognitive Domain)

- i.
- ii.
- iii.
- iv.

b) Practical Outcomes (in Psychomotor Domain)

- i.
- ii.
- iii.
- iv.

c) Affective Domain Outcomes

- i.
- ii.
- iii.
- iv.

D. SUGGESTED RUBRIC FOR ASSESSMENT OF CAPSTONE PROJECT

(please tick below the appropriate rating i.e. poor, average etc., for each characteristic to be assessed and give marks in the respective cell according to performance of student)

S. No.	Characteristic to be assessed	Poor	Average	Good	Excellent	Max. Marks	marks obtained
First Progressive Assessment (at the end of 4 th week)							



S. No.	Characteristic to be assessed	Poor	Average	Good	Excellent	Max. Marks	marks obtained
1	Problem/Task Identification (Project Title)	Relate to very few POs Scope of Problem not clear at all	i. Related to some POs ii. Scope of Problem/Task vague	i. Take care of at-least Three POs ii. Scope of Problem/task not very specific	i. Take care of more than three POs ii. Scope of problem/task very clear	02	
2	Literature Survey /Industrial Survey	Not more than ten sources (primary and secondary), very old reference	At-least 10 relevant sources, at least 5 latest	At –least 15 relevant sources, most latest	About 20 relevant sources, most latest	02	
Second Progressive Assessment (at the end of 12th week)							
3	Project proposal	Methods are not appropriate, All steps not mentioned, Design of prototype not started (if applicable).	Appropriate plan but not in much detail. Plan B for critical activities not mentioned. Time line is not developed. Design of Prototype is not complete. (if applicable)	Appropriate and detailed plan with Plan B for critical activities mentioned, but clarity is not there in methods, time line is given but not appropriate. Design of prototype is not detailed (if applicable)	Appropriate and detailed plan with Plan B for critical activities mentioned, clarity in methods with time line, Detailed design of prototype (if applicable)	02	
4	Execution of Plan in fifth semester (please write by hand about students performance in appropriate column)					02	
5	Log Book	Entries for most weeks are missing. There is no proper sequence and details are not correct.	Entries for some weeks are missing, details are not appropriate, not signed regularly by the guide.	Entries were made every week but are not in detail. Signed and approved by guide every week	Entries were made every week in detail, signed and approved by guide every week	03	
Third progressive Assessment at the end of 14th week							
6	Portfolio Preparation	Answer to only few of the 'questions from self' (prompts)	Answer to only about 50% of the 'questions from self'	Answer to most of the 'questions from self' (prompts) written. Some	Answer to nearly all the 'questions from self' (prompts) written in detail	03	



S. No.	Characteristic to be assessed	Poor	Average	Good	Excellent	Max. Marks	marks obtained
		written. Answers are not in much detail	(prompts) written. Answers are not in much detail	answers are not in much detail			
7	Final Report Preparation	Very short, poor quality sketches, Details about methods, material, precaution and conclusions omitted, some details are wrong Nearly sufficient and correct details about methods, material, precautions and conclusion. but clarity is not there in presentation, not enough graphic description.	Detailed, correct and clear description of methods, materials, precautions and	Conclusions, Sufficient Graphic Description.	Very detailed, correct, clear description of methods, materials, precautions and conclusions. Enough tables, charts and sketches	04	
8	Presentation	Major information is not included, information is not well organized .	Includes major information but not well organized and not presented well	Includes major information and well organized but not presented well	Well organized, includes major information ,well presented	03	
9	Defense	Could not reply to considerable number of question.	Replied to considerable number of questions but not very properly	Replied properly to considerable number of question.	Replied to most of the questions properly	04	
Total marks						25	

Any Other Comment:

.....

.....

Name and designation of the Faculty Member.....

Signature.....



Program Name : Diploma in Civil Engineering/ Computer Engineering /
**Information Technology /Automobile Engineering/ Fashion &
 Clothing Technology / Electrical Engineering Group / Electronics
 Engineering Group**

Program Code : CE/CR/CS/CO/CM/CW/IF/AE/DC/EE/EP/EU/DE/EJ/ET/EN/
EX/EQ/IE/IS/IC

Semester : Fifth

Course Title : Environmental Studies

Course Code : 22447

1. RATIONALE

The world today is facing the biggest challenge of survival. Degradation of ecosystem, depletion of natural resources, increasing levels of pollution pose major threat to the survival of mankind. The need of the hour, therefore, is to concentrate on the area of environmental aspects, which shall provide an insight into various environment related issues. Environmental studies are an interdisciplinary academic field that integrates physical, chemical and biological sciences, with the study of the environment. It provides an integrated, quantitative, and interdisciplinary approach to the study of environmental system & gives an insight into solutions of environmental problems.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Diagnose and manage environment related issues

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- Develop Public awareness about environment
- Select alternative energy resources for Engineering Practice
- Conserve Ecosystem and Biodiversity
- Apply techniques to reduce Environmental Pollution
- Manage social issues and Environmental Ethics as lifelong learning

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	-	-	3	90 Min	70*#	28	30*	00	100	40						

(#) Online Theory Examination.



(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit, ESE - End Semester Examination; PA - Progressive Assessment

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

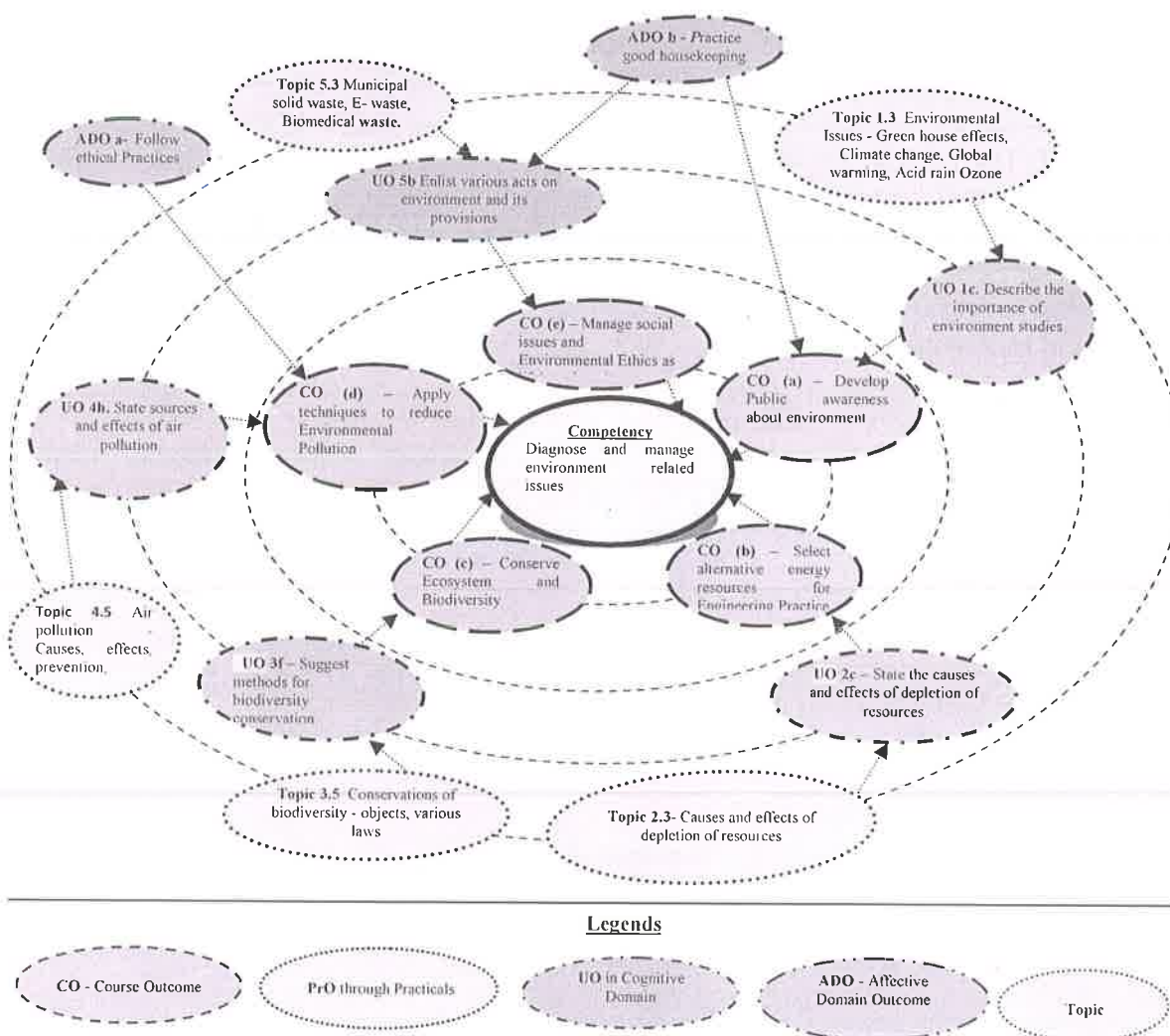


Figure 1 - Course Map

6. SUGGESTED EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency:

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
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S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	NIL		
	Total		

Note

- A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.
- The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
1	NIL	
	Total	

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- Follow safety practices.
- Practice good housekeeping.
- Practice energy conservation.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment.
- Follow ethical Practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	NIL	-

8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.



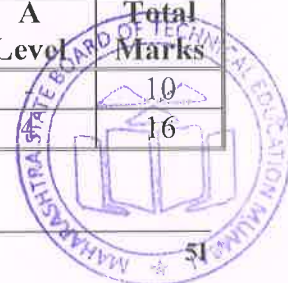
Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Environment	1a. Discuss the scope of Environment. 1b. Describe various types of environment 1c. Describe the importance of environment studies. 1d. Discuss about the need of public awareness about environment. 1e. Describe various environmental issues.	1.1 Definitions, need of environmental studies. 1.2 Segments of environment- Atmosphere, Hydrosphere Lithosphere, Biosphere. 1.3 Environmental Issues - Green house effects, Climate change, Global warming, Acid rain Ozone layer depletion, Nuclear accidents. 1.4 Concept of 4R (Reduce, Reuse, Recycle and Recover), 1.5 Public awareness about environment.
Unit– II Energy Resources	2a. List various natural resources. 2b. Describe Renewable, Nonrenewable and Cyclic resources. 2c. State the causes and effects of depletion of resources. 2d. State advantages and disadvantages of forms of energy. 2e. Select appropriate solutions of efficient use of energy. 2f. State the impacts of overuse of natural resources.	2.1 Natural Resources - Forest Resources, Water Resources, Energy Resources, Land resources, Mineral resources. 2.2 Renewable, Non-renewable and Cyclic Resources. 2.3 Causes and effects of depletion of resources. 2.4 Energy forms (Conventional and non-conventional). 2.5 Present global energy use and future demands. 2.6 Energy conservation. 2.7 Over use of natural resources and its impacts on environment.
Unit- III Ecosystem and Biodiversity	3a. State the aspects and division of ecosystem. 3b. State the general characteristics and function of ecosystem. 3c. List levels of biodiversity. 3d. Enlist the endangered species. 3e. Describe value of biodiversity. 3f. Suggest methods for biodiversity conservation.	3.1 Ecosystem - Definition , Aspects of ecosystem, Division of ecosystem, General characteristics of ecosystem, Functions of ecosystem. 3.2 Biodiversity - Definitions, Levels, Value and loss of biodiversity. 3.3 Biodiversity assessment initiatives in India. 3.4 Threats and Hotspots of biodiversity. 3.5 Conservations of biodiversity - objects, various laws.
Unit– IV Environmental Pollution	4a. Define pollution. 4b. State the sources of pollution. 4c. State the effects of land pollution on environment and lives. 4d. State various units and their functions of water treatment plant. 4e. State the needs of water conservation.	4.1 Definition of pollution, types- Natural & Artificial (Man- made). 4.2 Soil / Land Pollution – Causes and effects on environment and lives , preventive measures. 4.3 Water Pollution - Sources of water (surface and sub surface), sources of water pollution, effects on environment and lives, preventive measures, BIS water quality

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	4f. State the impacts of sewage. 4g. State various units and their functions of sewage treatment plant. 4h. State sources and effects of air pollution. 4i. Describe various methods to prevent air pollution. 4j. State sources and effects of noise pollution. 4k. Describe preventive measures for noise pollution. 4l. State characteristics of solid waste. 4m. State the impacts of solid waste. 4n. Describe incineration, RDF and sanitary landfilling. 4o. State the standards limiting/controlling values of various types of pollution.	standards, flow diagram of water treatment plant, Water conservation. 4.4 Wastewater - Generation(domestic and industrial), Impacts, flow diagram of sewage treatment plant, CPCB norms of sewage discharge. 4.5 Air pollution - Causes, effects, prevention, Ambient air quality standards. 4.6 Noise pollution - Sources, effects, prevention, noise levels at various zones of the city. 4.7 Municipal Solid Waste, Bio-medical waste and E-waste - Sources, generation, characteristics, effects, and methods to manage.
Unit-V Social Issues and Environmental Education	5a. Elaborate article (48-A) and (51-A (g)) 5b. Enlist various acts on environment and its provisions. 5c. State the roles and responsibilities of CPCB. 5d. Define sustainable development, and EIA. 5e. Describe rain water harvesting and groundwater recharge. 5f. Differentiate between formal and non formal education.	5.1 Article (48-A) and (51-A (g)) of Indian Constitution regarding environment, Environmental protection and prevention acts, CPCB and MPCB norms and responsibilities, The role of NGOs. 5.2 Concept of sustainable development, EIA and environmental morality. 5.3 Management Measures - Rain Water harvesting, Ground water recharge, Green Belt Development, Use of Renewable energy, water shed management, interlinking of rivers. 5.4 Role of information technology in environment and human health.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' and above of Bloom's 'Cognitive Domain Taxonomy'

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Environment	06	4	6		10
II	Energy Resources	10	4	8		16



Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
III	Ecosystem and Biodiversity	08	4	4	4	12
IV	Environmental Pollution	16	8	8	4	20
V	Social Issues and Environmental Education	08	4	4	4	12
Total		48	24	30	16	70

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Plant and adopt a tree in your nearby locality/Polytechnic campus and prepare report about its growth and survival after six months with photos.
- Organize seminar on air pollutants of relevant MIDC area/vehicle
- Organize poster exhibition about global warming and ozone depletion.
- Visit a nearest water purification/effluent treatment plant.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- '**L**' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).
- With respect to item No.10, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
- Guide student(s) in undertaking micro-projects.
- Use proper equivalent analogy to explain different concepts.
- Use Flash/Animations to explain various topics.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be **individually** undertaken to build up the skill and confidence in every student to become problem solver so



that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects are given here. Similar micro-projects could be added by the concerned faculty:

- Prepare a report on visit to PUC Center.
- Visit a near by RO plant and prepare detail technical report.
- Prepare report on Household water filtration unit
- Prepare a list of polluted natural resources which are responsible for pollution and collect information on how to manage them .
- Collection of Data from Hospital:** Collect everyday information on percentage of solid hazardous and toxic waste for two month
- Visit of Municipal Effluent Treatment Plant:** Visit effluent treatment plant and prepare report on waste management.
- Visit of Water Treatment Plant:** Visit water treatment plant and prepare report on various units of water treatment and its management.
- Preparation of report:** Prepare the chart of solid waste management showing effects on environment.
- And any other relevant topic related to course**

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Basic Environmental Sciences	Michael Allaby	Routledge Publication, 2 nd Edition, 2000, ISBN: 0-415-21176-X
2	Environmental Science	Y. K. Singh	New Age International Publishers, 2006, ISBN: 81-224-2330-2
3	Environmental Studies	Erach Bharucha	University Grants Commission, New Delhi
4	Environmental Studies	Rajagopalan	Third Edition, Oxford University Press, USA, ISBN: 9780199459759, 0199459754
5	A text book of Environmental Science	Arvind Kumar	APH Publishing New Delhi
6	A text book of Environmental Studies	Shashi Chawla	Tata Mc Graw-Hill New Delhi

14. SOFTWARE/LEARNING WEBSITES

- www.eco-prayer.org
- www.teriin.org
- www.cpcb.nic.in



- d. www.indiaenvironmentportal.org.in
- e. www.whatis.techtarget.com
- f. www.sustainabledevelopment.un.org
- g. www.conserve-energy-future.com



Program Name : Computer Engineering Program Group
Program Code : CO/CM/IF/CW
Semester : Fifth
Course Title : Operating System
Course Code : 22516

1. RATIONALE

An Operating System is basically a system program that controls the execution of application programs and acts as an interface between applications and the computer hardware. It manages the computer system resources to be used in an efficient manner. This course enables to learn internal functioning of operating system and will help in identifying appropriate Operating System for given applications/task. This course is also a prerequisite for the group of courses included in 'Cloud Infrastructure Maintenance' Elective group.

2. COMPETENCY

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

- **Manage operations of Operating System.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following *industry oriented* COs associated with the above mentioned competency:

- Install operating system and configure it.
- Use operating system tools to perform various functions.
- Execute process commands for performing process management operations.
- Apply scheduling algorithms to calculate turnaround time and average waiting time.
- Calculate efficiency of different memory management techniques.
- Apply file management techniques.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20

(*): Under the theory PA; Out of 30 marks, 10 marks of theory PA are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs.

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit, ESE - End Semester Examination; PA - Progressive Assessment

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the



course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

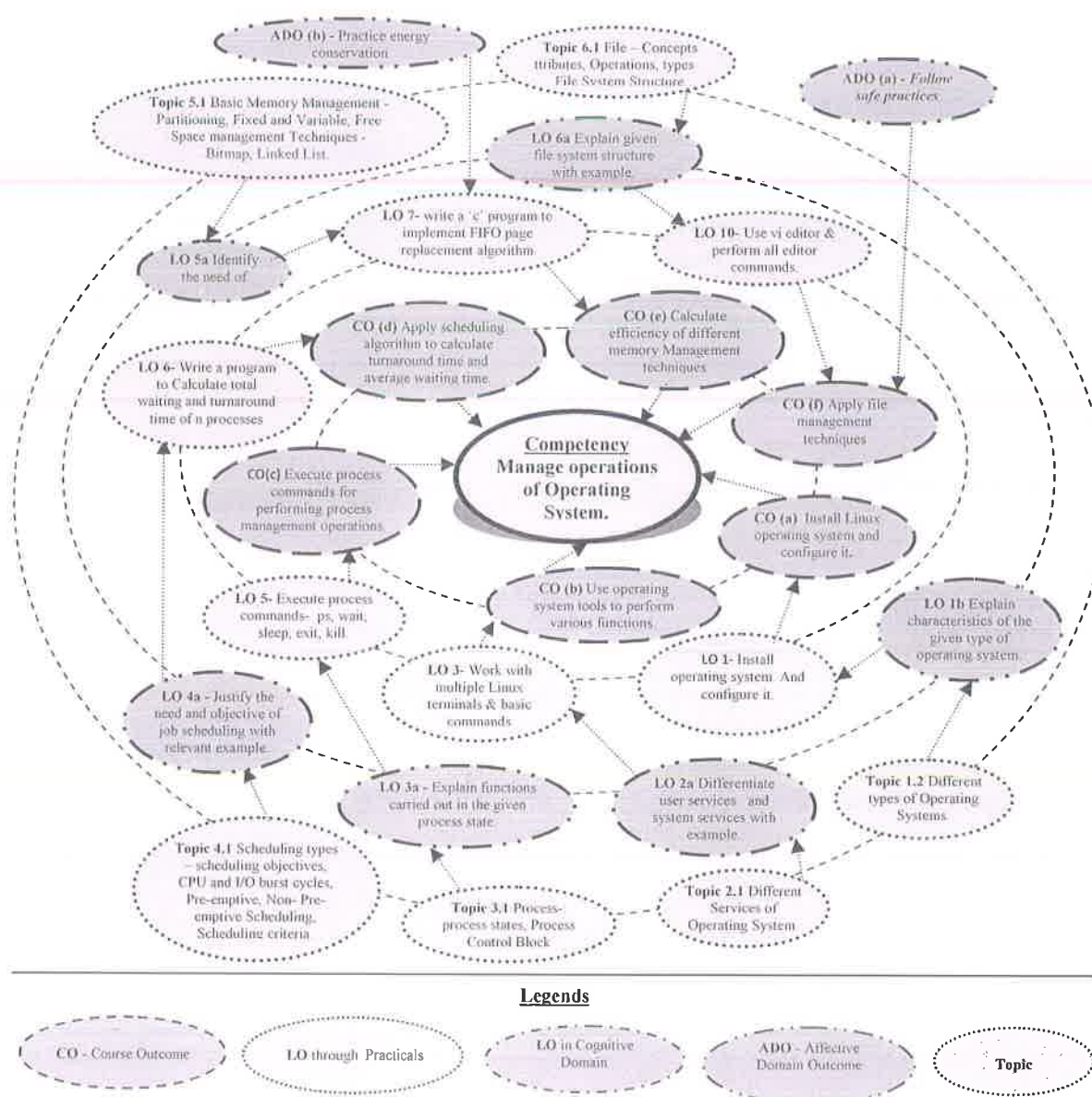


Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	Install and configure Linux (or alike) operating system.	I	02*
2.	Execute general purpose commands date, time, cal, clear, banner, tty, script, man.	I	02*
3.	Work with multiple linux terminals and basic commands: who, who am I, login, passwd, su, pwd.	II	02*
4.	a) Use Operating services(Editor, GUI, File handling.)	II	02*



Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
	b) Run commands to start, stop, and restart the specified service in Linux.		
5.	Execute process commands- ps, wait, sleep, exit, kill.	III	02*
6.	Write a program to calculate total waiting and turnaround time of n processes with First Come First Serve CPU scheduling algorithm.	IV	02
7.	Write a 'C' program to implement FIFO page replacement algorithm.	V	02
8.	Execute file and directory manipulation commands – ls, rm, mv, cp, join, split, cat (file saving and redirection operator), head, tail, touch,	VI	02*
9.	Execute file and directory manipulation commands – diff, comm., pr, chmod, mkdir, rmdir, cd, pwd, dir, cmp. (Use wild card character).	VI	02*
10.	Execute text processing tr, wc, cut, paste, spell, sort, grep, more.	VI	02*
11.	Use vi editor and perform all editor commands.	VI	04*
12.	Write and execute Shell Script by using following Control statements features- "if" statement	VI	02*
13.	Write and execute Shell Script by using following Control statements features- "for" statement, exit, break, continue	VI	02*
14.	Write Shell script to find out whether - Given file exists?	VI	02
15.	Write Shell script to find out whether - File has read, write, and execute permissions?	VI	02*
Total			32

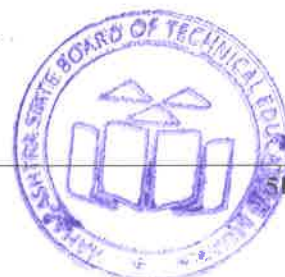
Note

- In the above listed example wherever **Linux** as operating system is mentioned, it could be replaced with other alike operating systems such as **Ubuntu, CentOS** or any other OS.
- A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Application Level' of Bloom's Taxonomy' as generally required by the industry.
- The 'Process' and 'Product' related skills associated with each PrO are to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
a.	Installation/configuration of operating system	25
b.	Correctness of Executing various commands	25
c.	Writing and executing programs to get desired output	20
d.	Debugging the program	15
e.	Submit journal report in time	15
Total		100

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- Follow safety practices.
- Practice good housekeeping.



- c. Demonstrate working as a leader/a team member.
- d. Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year and
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

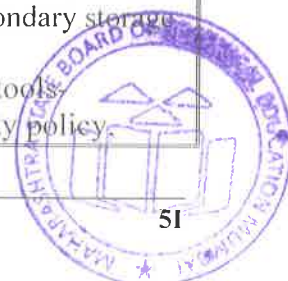
The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO S. No.
1	Computer system (Any computer system with basic configuration)	All
2	Linux or alike operating system such as Ubuntu, CentOS or any other.	

8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Overview of Operating System	1a. Explain the functioning of given component of OS. 1b. Explain characteristics of the given type of operating system. 1c. Identify type of operating system suitable for the given type of application. 1d. Execute command on command line for the given task.	1.1 Operating System – Concept, Components of operating system, operations of OS: Program Management, Resource management, Security and protection. Views of OS: User view, System View 1.2 Different Types of Operating systems- Batch operating system, Multi Programmed, Time Shared OS, Multiprocessor Systems, Distributed Systems, Real time systems. Mobile OS (Android,iOS). 1.3 Command line based OS – DOS, UNIX GUI based OS –WINDOWS, LINUX.
Unit– II Services and Component s of Operating System	2a. Start, stop, and restart the given service in Linux. 2b. Explain use of the given System call of specified OS. 2c. Explain process the OS follows in managing the given resource. 2d. Explain use of the given operating system tool.	2.1 Different Services of Operating System. 2.2 System Calls- Concept, types of system calls 2.3 OS Components: - Process Management, Main Memory Management, File Management, I/O System management, Secondary storage management. 2.4 Use of operating system tools- user management, security policy.



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		device management, performance monitor, task scheduler
Unit- III Process Managem nt	3a. Explain functions carried out in the given process state. 3b. Describe the function of the given component of process stack in PCB. 3c. Explain characteristics of the given multithreading model. 3d. Describe method of executing the given process command with example.	3.1 Process:- process states, Process Control Block (PCB). 3.2 Process Scheduling- Scheduling Queues, Schedulers, Context switch. 3.3 Inter-process communication (IPC): Introduction, shared memory system and message passing system. 3.4 Threads - Benefits, users and kernel threads, Multithreading Models - Many to One, One to One, Many to Many. 3.5 Execute process commands- like ps, wait, sleep, exit, kill
Unit-IV CPU Scheduling and Algorithms	4a. Justify the need and objective of given job scheduling criteria with relevant example. 4b. Explain with example the procedure of allocating CPU to the given process using the specified OS. 4c. Calculate turnaround time and average waiting time of the given scheduling algorithm. 4d. Explain functioning of the given necessary condition leading to deadlock.	4.1 Scheduling types – scheduling Objectives, CPU and I/O burst cycles, Pre-emptive, Non- Pre-emptive Scheduling, Scheduling criteria. 4.2 Types of Scheduling algorithms - First come first served (FCFS), Shortest Job First (SJF), Shortest Remaining Time(SRTN), Round Robin (RR) Priority scheduling, multilevel queue scheduling. 4.3 Deadlock - System Models, Necessary Conditions leading to Deadlocks, Deadlock Handling - Preventions, avoidance.
Unit –V Memory Managem ent	5a. Describe the working of specified memory management function. 5b. Explain characteristic of the given memory management techniques. 5c. Write algorithm for the given page replacement technique. 5d. Calculate Page fault for the given page reference string.	5.1 Basic Memory Management - Partitioning, Fixed and Variable, Free Space management Techniques - Bitmap, Linked List. 5.2 Virtual Memory – Introduction to Paging, Segmentation, Fragmentation, and Page fault. 5.3 Page Replacement Algorithms: FIFO, LRU, Optimal.
Unit-VI File Managem ent	6a. Explain structure of the given file system with example. 6b. Describe mechanism of the given file access method. 6c. Explain procedure to create and access directories and assign the given files access permissions. 6d. Explain features of the given Raid level structure of hard disk.	6.1 File – Concepts, Attributes, Operations, types and File System Structure. 6.2 Access Methods – Sequential, Direct, Swapping, File Allocation Methods- Contiguous, Linked, Indexed. 6.3 Directory structure— Single level, two levels, tree-structured directory, Disk Organization and disk Structure- Physical structure, Logical structure, Raid structure of disk, raid level 0 to 6.



Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Overview of Operating System	06	02	02	04	08
II	Services and Components of Operating System	06	02	04	04	10
III	Process Management	10	02	04	08	14
IV	CPU Scheduling and Algorithms	10	02	04	08	14
V	Memory Management	10	02	04	08	14
VI	File Management	06	02	04	04	10
Total		48	12	22	36	70

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Prepare journal of practicals.
- Undertake micro-projects.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various learning outcomes in this course:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- '**L**' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).
- With respect to item No.10, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
- Guide student(s) in undertaking micro-projects.
- Demonstrate students thoroughly before they start doing the practice.
- Encourage students to refer different websites to have deeper understanding of the subject.
- Observe continuously and monitor the performance of students in Lab.



12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be **individually** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects are given here. Similar micro-projects could be added by the concerned faculty:

- Create a report depicting features of different types of Operating systems- Batch operating system, Multi Programmed, Time Shared, Multiprocessor Systems, , Real time systems. Mobile OS with example.
- Make a comparative statement to calculate page fault for given page reference string by using different page replacement algorithms.
- Prepare help guide using shell script for all the major Linux commands.
- Make a comparative chart to calculate total waiting and turnaround time of n processes with different CPU scheduling algorithm.

Any other micro-projects suggested by subject faculty on similar line.

(Use features of 'C' or shell scripts to develop above listed applications)

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Operating System Concepts	Silberschatz, Galvin	John Wiley and Sons, Ninth Edition, 2015, ISBN: 978-51-265-5427-0
2	Operating System	Godbole, Achyut S.	Tata McGraw Hill Education, 2015, ISBN: 9780070591134
3	Operating Systems: Internals and Design Principles	Stallings, William	Pearsons, 8 edition 2015 ISBN: 978-0133805918
4	Unix Concept and Programming	Das, Sumitabha	McGraw Hill education, 2015, ISBN: 978-0070635463
5	Operating System	Dhamdhere, Dhanjay M.	McGraw Hill, 2015 ISBN MO 978-1-25-900558-9
6	Operating System	Dr. Rajendra Kawale	Devraj Publications, Mumbai ISBN 978-81-933551-1-4

14. SOFTWARE/LEARNING WEBSITES

- www.cs.wisc.edu/~bart/537 lecture notes-University of Wisconsin Madison.
- www.cs.kent.edu/osf/o3/notes/index.html- Vilinius Gediminas Technical University
- <http://www.howstuffworks.com/operating-system1.htm>
- www.computerhope.com/jargon/o/os.htm
- www.en.wikipedia.org/wiki/Operating_system
- <https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/12-MassStorage.html>





Program Name : Computer Engineering Program Group
Program Code : CO/CM/IF/CW
Semester : Fifth
Course Title : Advanced Java Programming
Course Code : 22517

1. RATIONALE

Java technology is widely used for web applications development. Based on the object oriented concepts and core Java concepts, this course will equip the students with the required knowledge and skill of object oriented programming approach needed for the development of robust, powerful web applications. Through this course students will get hands-on experience on GUI Technologies viz. AWT and Swings, event handling mechanisms and network programming. The course also gives coverage to various web applications aspects like Database Interaction, server side components and servlets.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Develop web and stand-alone applications using advanced concepts of Java.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following *industry oriented* COs associated with the above mentioned competency:

- Develop programs using GUI Framework (AWT and Swing).
- Handle events of AWT and Swings components.
- Develop programs to handle events in Java Programming.
- Develop Java programs using networking concepts.
- Develop programs using database.
- Develop programs using Servlets.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	1	2	6	2	70*#	28	30*	00	100	40	25#	10	25	10	50	20

(*): Under the theory PA; Out of 30 marks, 10 marks of theory PA are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs.

Legends: **L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** -Practical; **C** – Credit, **ESE** -End Semester Examination; **PA** - Progressive Assessment.

5. COURSE MAP(with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the



course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

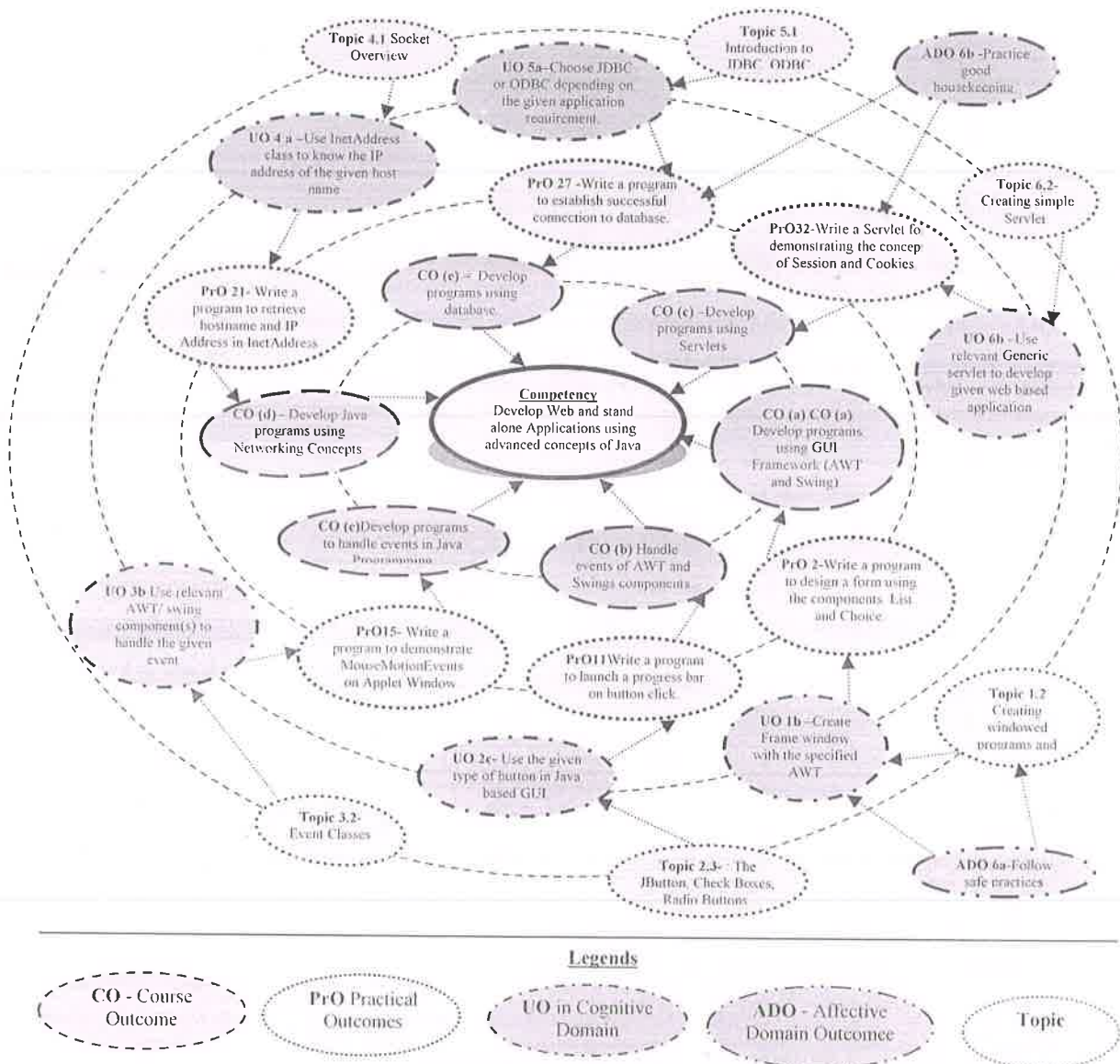


Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs(i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	Write a program to demonstrate the use of AWT components like Label, TextField, TextArea, Button, Checkbox, RadioButton etc.	I	02*
2.	Write a program to design a form using the components List and Choice.	I	02*
3.	Write a program to design simple calculator with the use of GridLayout	I	02*
4.	Write a program to create a two-level card deck that allows the user to select component of Panel using CardLayout		02*
5.	Write a program using AWT to create a menubar where menubar contains menu items such as File, Edit, View and create a submenu		02*



Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
	under the File menu: New and Open.		
6.	Write a program using swing to display a ScrollPane and JcomboBox in an Applet with the items – English, Marathi, Hindi, Sanskrit.	II	02*
7.	Write a program to create a Jtree.	II	02*
8.	Write a program to create a JTable.	II	02
9.	Write a program to launch a JProgressBar	II	02
10.	Write a program to demonstrate status of key on Applet window such as KeyPressed, KeyReleased, KeyUp, KeyDown	III	02*
11.	Write a program to demonstrate various mouse events using MouseListener and MouseMotionListener interface	III	02*
12.	Write a program to demonstrate the use of JTextField and JPasswordField using Listener Interface	II	02*
13.	Write a program to demonstrate the use of WindowAdapter class.	III	02
14.	Write a program to demonstrate the use of InetAddress class and its factory methods.	IV	02*
15.	Write a program to demonstrate the use of URL and URLConnection class and its methods	IV	02*
16.	Write a program to implement chat Server using ServerSocket and Socket class.	IV	02
17.	Write a program to demonstrate use of DatagramSocket and Datagram Packet	IV	02
18.	Write a program to insert and retrieve the data from database using JDBC	V	02*
19.	Write a program to demonstrate the use of PreparedStatement and ResultSet interface	V	02
20.	Write a program to update and delete a record from a database table.	V	02
21.	Write a program to demonstrate the use of HttpServlet as a parameterized Servlet	VI	02
22.	Write a Servlet program to send username and password using HTML forms and authenticate the user	VI	02*
23.	Write a program to create Session using HttpSession class	VI	02
24.	Write a program to implement Session tracking using Cookies.	VI	02

Note

- A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 14 or more practical need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Application Level' of Bloom's Taxonomy as generally required by the industry.
- It is advisable to conduct 50% of the practicals using ASCII text editor and compilation on command prompt so as to enhance fundamental understanding of basic concepts and syntax. The IDEs must be Introduced at later stage.
- The 'Process' and 'Product' related skills associated with each PrO are to be assessed according to a suggested sample given below:



Sr. No.	Performance Indicators	Weightage in %
1	Logic Building and Coding	50
2	Testing and Debugging of the Program.	30
3	Correctness of Program Output.	10
4	Submission of practical assignment in time.	10
Total		100

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- Follow safety practices.
- Practice good housekeeping.
- Work as a leader/a team member.
- Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year and
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO No.
1	Computer with JDK1.5 or above ,any IDE for Java Programming such as Eclipse, Jcreator, NetBeans.	All
2	Databases like MySQL, Oracle, MS-Access or any other	18,19,20
3	Apache Tomcat web server version 7 or higher.	21-24

8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Abstract Windowing Toolkit (AWT)	1a. Develop Graphical user interface (GUI) programs using AWT components for the given problem. 1b. Create Frame window with the specified AWT components. 1c. Arrange the GUI components using specified layout manager. 1d. Develop a program using menu and Dialog Boxes for the given problem.	1.1 Component, container, window, frame, panel. 1.2 Creating windowed programs and applets. 1.3 AWT controls and layout managers: use of AWT controls: labels, buttons, checkbox, checkbox group, scroll bars, text field, text area. 1.4 Use of layout managers: flowLayout, BorderLayout.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		gridLayout, cardLayout, gridbagLayout, menubars, menus, dialog boxes, file dialog.
Unit-II Swings	2a. Differentiate between AWT and Swing on the given aspect. 2b. Develop Graphical user interface (GUI) programs using swing components for the given problem. 2c. Use the given type of button in Java based GUI. 2d. Develop Graphical user interface (GUI) programs using advanced swing components for the given problem.	2.1 Introduction to swing: Swing features, Difference between AWT and Swing. 2.2 Swing Components: JApplet, Icons and Labels, Text Fields, Combo Boxes. 2.3 Buttons: The JButton, Check Boxes, Radio Buttons. 2.4 Advanced Swing Components: Tabbed Panes, Scroll Panes, Trees, Tables, Progress bar, tool tips. 2.5 MVC Architecture.
Unit- III Event Handling	3a. Use delegation event model to develop event driven program for the given problem. 3b. Use relevant AWT/ swing component(s) to handle the given event. 3c. Use Adapter classes in Java program to solve the given problem. 3d. Use inner classes in java program to solve the given problem.	3.1 The delegation Event Model: Event sources, Event listeners 3.2 Event classes: The Action Event class, the Item Event class, the Key Event class, the Mouse Event class, the Text Event class, the Window Event class. 3.3 Adapter classes. 3.4 Inner classes. 3.5 Event listener interfaces: ActionListener Interface, ItemListener Interface, KeyListener Interface, MouseListener Interface, MouseMotion Interface, TextListener Interface, WindowListener Interface.
Unit- IV Networking Basics	4a. Use InetAddress class to know the IP address of the given host name. 4b. Use URLConnection classes to read and write data to the specified resource referred by the given URL. 4c. Develop program for Client/Server communication through TCP/IP Server sockets for the given problem. 4d. Write program to illustrate the Client/Server communication using datagram protocol for the given problem.	4.1 Socket Overview: Client/Server, Reserved Sockets, Proxy Servers, Internet Addressing. 4.2 Java and the Net: The Networking Classes and interfaces. 4.3 InetAddress: Factory Methods, Instance Methods. 4.4 TCP/IP Client Sockets: Whois 4.5 URL: Format, The URI Class. 4.6 URLConnection: TCP/IP Server Sockets. 4.7 Datagrams: DatagramPacket, Datagram Server and Client.
Unit -V Interacting with	5a. Choose JDBC or ODBC depending on the given application requirement.	5.1 Introduction to JDBC, ODBC 5.2 JDBC Architecture: Two-tier and three tier models



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Database	5b. Explain function of the given tier of JDBC architecture for two tier/three tier models. 5c. Use relevant type of JDBC Driver for the specified environment. 5d. Elaborate steps with example to establish connectivity with the specified database.	5.3 Types of JDBC Drivers 5.4 Driver Interfaces and Driver Manager class: Connection Interface, Statement Interface, PreparedStatement Interface, ResultSet Interface 5.5 The essential JDBC Program
Unit –VI Servlets	6a. Explain function of the given method of Servlet life cycle. 6b. Use relevant Generic servlet to develop given web based application. 6c. Use relevant HTTP servlet to develop specified web based application. 6d. Develop servlet for cookies and session tracking to implement the given problem.	6.1 The Life Cycle of a Servlet 6.2 Creating simple Servlet: The Servlet API, javax.servlet Package, Servlet Interface, ServletConfig Interface, ServletContext Interface, ServletRequest Interface, ServletResponse Interface, GenericServlet Class 6.3 The javax.servlet.http package: HttpServletRequest Interface, HttpServletResponse Interface, HttpSession Interface, Cookie Class, HttpServlet Class, HttpSessionEvent Class, HttpSessionBindingEvent Class. 6.4 Handling HTTP Requests and Responses Handling HTTP GET Requests Handling HTTP POST Requests. 6.5 Cookies and Session Tracking.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Abstract Windowing Toolkit(AWT)	08	02	04	06	12
II	Swings	08	02	02	06	10
III	Event Handling	08	02	02	08	12
IV	Networking Basics	06	02	04	04	10
V	Interacting with Database	08	02	04	06	12
VI	Servlets	10	04	04	06	14
Total		48	14	20	36	70

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)



Note: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Prepare journals based on practical performed in laboratory.
- Follow coding standards.
- Develop variety of programs to improve the logical skills.
- Develop Application oriented real world programs.
- Prepare power point presentation depicting different advanced concepts in Java.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- 'L' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).
- With respect to item No.10, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
- Use different Audio Visual media for Concept understanding.
- Guide student(s) in undertaking micro-projects.
- Demonstrate students thoroughly before they start doing the practice.
- Observe continuously and monitor the performance of students in Lab.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be **individually** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

- Energy Billing System: Expected to develop bill amount module based on usage of energy consumption.



- b) Medical Store stock Management System: Expected to develop an Inventory module.
- c) Library book issue Management System.
- d) Restaurant Management System: Expected to develop a module to place an order and generate bill.
- e) Online Bus ReservationSystem: Expected to develop Ticket booking module.

Follow the below given guidelines for micro projects:

- i. Must implement concepts of AWT or SWING andEvent Handling.
- ii. UseJDBC concepts.
- iii. UseServlet.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1.	Complete Reference	Schildt, Herbert	Mcgraw Hill Education, New Delhi ISBN:9789339212094
2.	Java 2 Programming Black Book	Holzner, Steven et al.	Dreamtech Press, New Delhi ISBN 10: 817722655X/ ISBN 13: 9788177226553
3.	Java Server Programming Tutorial JAVA EE6 Black Book	Kogent Learning Solutions	Dreamtech Press, New Delhi ISBN :978-81-7722-937-0

14. SOFTWARE/LEARNING WEBSITES

- a) <https://www.tutorialspoint.com/java>
- b) <http://nptel.ac.in/courses/106105084/30>
- c) <https://www.javatpoint.com/servlet-tutorial>
- d) <https://www.tutorialspoint.com/servlets>
- e) <https://www.javatpoint.com/free-java-projects>
- f) <http://1000projects.org/java-projects.html>



Program Name : Computer Engineering Program Group
Program Code : CO/CM/IF/CW
Semester : Fifth
Course Title : Client Side Scripting Language (Elective)
Course Code : 22519

1. RATIONALE

JavaScript is limited featured client side programming language. JavaScript runs at the client end through the user's browser without sending messages back and forth to the server. It is widely used by the web developers to do things such as build dynamic web pages, respond to events, create interactive forms, validate data that the visitor enters into a form, control the browser etc. This course helps student to create highly interactive web pages using these features.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Develop Dynamic Web Pages using JavaScript.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following **industry oriented** COs associated with the above mentioned competency:

- Create interactive web pages using program flow control structure.
- Implement Arrays and functions in Java script.
- Create event based web forms using Java script.
- Use JavaScript for handling cookies.
- Create interactive webpage using regular expressions for validations.
- Create Menus and navigations in web Pages.

4. TEACHING AND EXAMINATION SCHEME

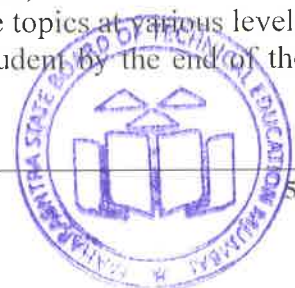
Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	-	2	5	3	70	28	30*	00	100	40	25#	10	25	10	50	20

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs.

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P -Practical; C – Credit, ESE -End Semester Examination; PA - Progressive Assessment.

5. COURSE MAP(with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the



course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

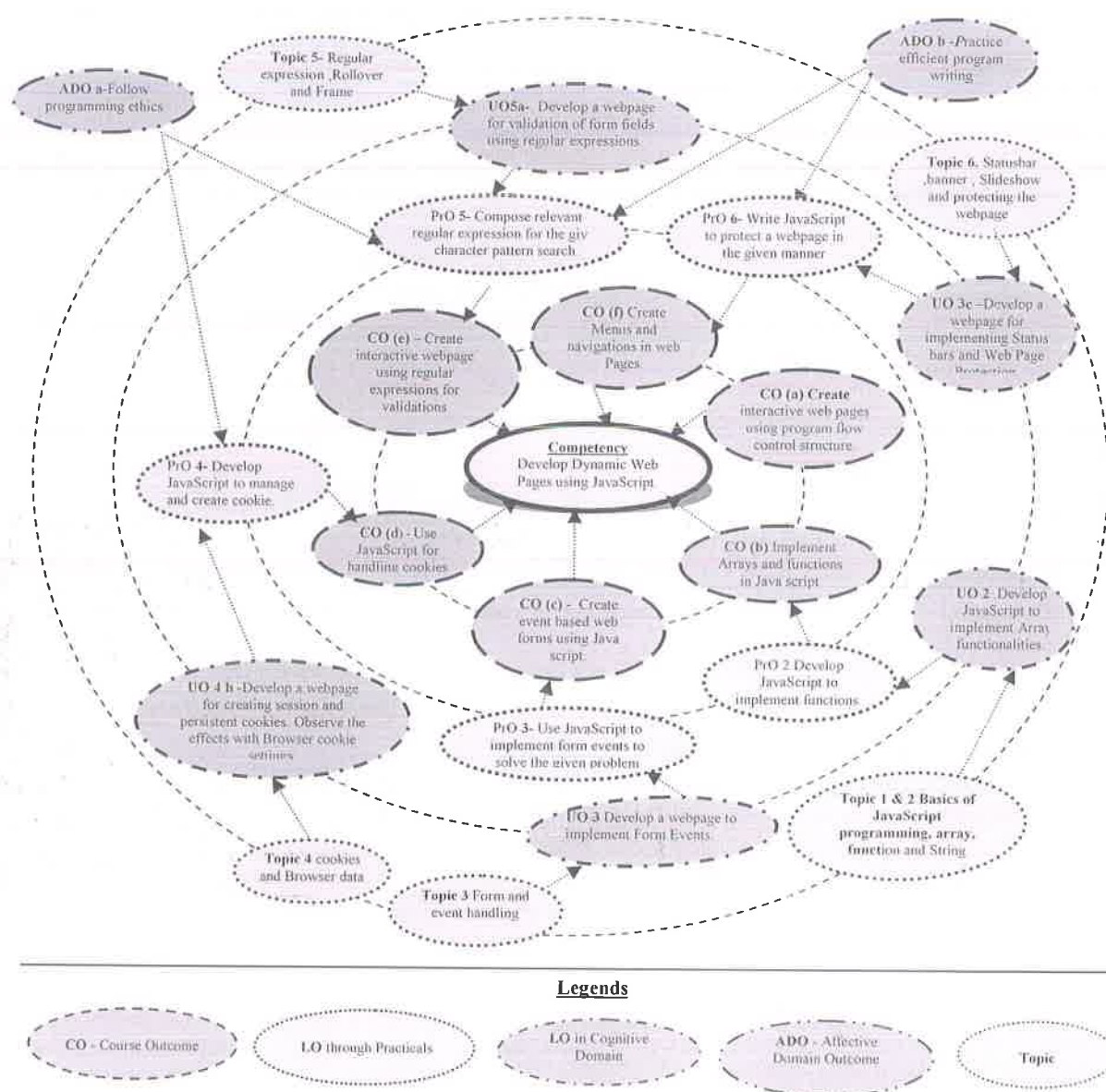


Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	Write simple javascript with HTML for arithmetic expression evaluation and message printing	I	02
2.	Develop JavaScript to use decision making and looping statements.	I	02*
3.	Develop JavaScript to implement Array functionalities.	II	02*
4.	Develop JavaScript to implement functions.	II	02*
5.	Develop JavaScript to implement strings.	II	02*
6.	Create a webpage using Form Elements.	III	02*

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
7.	Create a webpage to implement Form Events. Part-I	III	02*
8.	Create a webpage to implement Form Events. Part-II	III	02*
9.	Develop a webpage using Intrinsic Java Functions.	III	02*
10.	Develop a webpage for creating session and persistent cookies. Observe the effects with Browser cookie settings.	IV	02*
11.	Develop a webpage for placing the Window on the screen and working with child window.	IV	02*
12.	Develop a webpage for validation of form fields using regular expressions.	V	02*
13.	Create a webpage with Rollovers effect.	VI	02
14.	Develop a webpage for implementing Menus.	VI	02*
15.	Develop a webpage for implementing Status bars and Web Page Protection.	VI	02
16.	Develop a webpage for implementing Slideshow, banner.	VI	02*
Total			32

Note:

- A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Application Level' of Bloom's Taxonomy' as generally required by the industry.
- 50% of Lab assignments must be done using traditional editor and run in different browsers so as to build up fundamental understanding capabilities of students.
- The 'Process' and 'Product' related skills associated with each PrO are to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
1	Use of relevant tags and attributes	10
2	Correctness of Coding.	40
4	Testing and Debugging of the Program.	30
5	Appearance of Program Output.	10
6	Submission of report in time.	10
Total		100

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- Follow safety practices.
- Practice good housekeeping.
- Demonstrate working as a leader/a team member.
- Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year



- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO. S.No.
1	Browser and Notepad/any Text editor/	All
2	Free Web page Designing Tool	All
3	Any IDE like Eclipse	All

8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Basics of JavaScript Programmi ng	1a. Create object to solve the given problem. 1b. Develop JavaScript to implement the switch-case statement for the given problem. 1c. Develop JavaScript to implement loop for solving the given iterative problem. 1d. Display properties of the given object using getters and setters. 1e. Develop program using basic features of JavaScript to solve the given problem.	1.1 Features of JavaScript 1.2 Object Name, Property, method, Dot syntax, main event. 1.3 Values and Variables 1.4 Operators and Expressions- Primary Expressions, Object and Array initializers, function definition expression, property access expressions, invocation expressions. 1.5 If Statement, if...else, if..elseif, nested if statement. 1.6 Switch...case statement 1.7 Loop statement – for loop, for...in loop, while loop, do...while loop, continue statement. 1.8 Querying and setting properties and deleting properties, property getters and setters.
Unit-II Array, Function and String	2a. Create array to solve the given problem. 2b. Perform the specified string manipulation operation on the given String(s). 2c. Develop JavaScript to implement the given function. 2d. Develop JavaScript to convert the given Unicode to character form. 2e. Develop JavaScript to convert the given character to Unicode and vice-versa.	2.1 Array - declaring an Array, Initializing an Array, defining an Array elements, Looping an Array, Adding an Array element, sorting an Array element, Combining an Array elements into a String, changing elements of an Array, Objects as associative Arrays 2.2 Function – defining a function, writing a function, adding an arguments, scope of variable and arguments, 2.3 Calling a function – calling a function with or without an argument, calling function from HTML, function calling another function. Returning a value from a function



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		2.4 String – manipulate a string, joining a string, retrieving a character from given position, retrieving a position of character in a string, dividing text, copying a sub string, converting string to number and numbers to string, changing the case of string, finding a Unicode of a character-charCodeAt(), fromCharCode().
Unit– III Form and Event Handling	3a. Write JavaScript to design a form to accept input values for the given problem. 3b. Use JavaScript to implement form events to solve the given problem. 3c. Develop JavaScript to dynamically assign specified attribute value to the given form control. 3d. Use the given intrinsic function with specified parameters.	3.1 Building blocks of a Form, properties and methods of form, button, text, text area, checkbox, radio button, select element. 3.2 Form events- mouse event, key events. 3.3 Form objects and elements. 3.4 Changing attribute value dynamically. 3.5 Changing option list dynamically 3.6 Evaluating checkbox selection 3.7 Changing a label dynamically 3.8 Manipulating form elements 3.9 Intrinsic JavaScript functions, disabling elements, read only elements.
Unit– IV Cookies and Browser Data	4a. Create cookies based on the given problem. 4b. Develop JavaScript to manage a cookie in the given manner. 4c. Write JavaScript to manipulate the specified attributes of window object in the given manner. 4d. Write JavaScript to create browser history of the given object.	4.1 Cookies – basic of cookies, reading a cookie value, writing a cookie value, creating a cookies, deleting a cookies, setting the expiration date of cookie 4.2 Browser – opening a window, giving the new window focus, window position, changing the content of window, closing a window, scrolling a web page, multiple windows at once, creating a web page in new window, JavaScript in URLs, JavaScript security, Timers, Browser location and history.
Unit –V Regular Expression, Rollover and Frames	5a. Compose relevant regular expression for the given character pattern search. 5b. Develop JavaScript to implement validations using the given regular expression. 5c. Create frames based on the given problem. 5d. Create window object as per the given problem.	5.1 Regular Expression - language of regular expression, finding non matching characters, entering a range of characters, matching digits and non digits, matching punctuations and symbols, matching words, replacing a the text using regular expressions, returning the matched characters, regular expression object properties. 5.2 Frames – create a frame, invisible



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	5e. Develop JavaScript for creating rollover effect for the given situation.	borders of frame, calling a child windows, changing a content and focus of a child window, writing to a child window, accessing elements of another child window. 5.3 Rollover – creating rollover, text rollover, Multiple actions for rollover, more efficient rollover.
Unit –VI Menus, navigation and web page protection	6a. Develop JavaScript to manage the given status bar. 6b. Develop JavaScript to create the given banner. 6c. Develop JavaScript to create the given slide show. 6d. Develop JavaScript to create the given Menu. 6e. Write JavaScript to protect a webpage in the specified manner.	6.1 Status bar- builds a static message, changing the message using rollover, moving the message along the status bar 6.2 Banner –loading and displaying banner advertisement. Linking a banner advertisement to url 6.3 Slide Show – creating a slide show 6.4 Menus- creating a pulldown menu, dynamically changing a menu, validating menu selection, Floating menu, chain select menu, tab menu, pop-up menu, sliding menu, highlighted menu, folding a tree menu, context menu, scrollable menu, side bar menu. 6.5 Protecting web page – hiding your code, disabling the right mouse button, JavaScript, concealing email address. 6.6 Frameworks of javascript and its application

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Basics of JavaScript Programming	10	04	04	04	12
II	Array, Function and String	10	02	04	08	14
III	Form and Event Handling	06	02	04	04	10
IV	Cookies and Browser Data	06	02	02	04	08
V	Regular Expression, Rollover & Frames	08	02	06	06	14
VI	Menus, navigation and web page protection	08	02	04	06	12
Total		48	14	24	32	70

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)



Note: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course:

- a) Prepare journals based on practical performed in laboratory.
- b) Prepare powerpoint presentation or animation for understanding different Client side scripting Concepts.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- a) Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- b) '**L**' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- c) About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).
- d) With respect to item No.10, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
- e) Use different Audio Visual materials for Concept understanding.
- f) Guide student(s) in undertaking micro-projects.
- g) Encourage students to refer different websites to have deeper understanding of the subject.
- h) Observe continuously and monitor the performance of students in Lab.
- i) 50% of Lab assignments must be done using traditional editor and run in different browsers so as to build up fundamental understanding capabilities of students.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be **individually** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:



- a) Create a web page that displays buyers information entry form containing name, address, city, pin code, mail Id, Phone Number, product details , payment mode. Frame different validation rules for user inputs. Use JavaScript and regular expressions to perform error checking on user input as per validation rules.
- b) Build a simple slide show in JavaScript with six unique images. Design appropriate web page with at least two sections: with slide show in one section. When any image on this slide show is clicked display information about it in other section. Use features for controlling window locations.
- c) Design and create web pages of an institute with different sections. Use pulldown menus in one section and implement validation of menu selections. Use other sections for displaying information about respective selected menu item.
- d) Create a simple animation in JavaScript : create a basic page showing circle of white marble. Using the setTimeout() method create an animation on the page that that makes an orange marble rotate around this circle by moving the orange marble to the next location in the circle every second. Allow the user to stop the animation by placing the cursor on any marble(use clearTimeout()).

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1.	JavaScript Demystified	Keogh, Jim	McGraw-Hill, 2015, New Delhi ISBN:0-07-060347-2
2.	Beginning JavaScript	Wilton, Paul	Wily India, New Delhi, 2015, ISBN:0-7645-5587-1
3.	Beginning JavaScript	McPeak, Jeremy and Wilton, Paul	Wily India, New Delhi, 2015, ISBN:81-265-1304-7
4.	JavaScript in 24 hours (SAMS teach yourself)	Moncur, Michael	TechMedia, New Delhi, 2015, ISBN:978-0-672-33608-9

14. SOFTWARE/LEARNING WEBSITES

- a) <https://www.w3schools.com>
- b) <http://www.nptelvideos.com>
- c) <http://www.tutorialspoint.com>.
- d) <Http://javapoint.com>



Program Name : Computer Engineering Program Group
Program Code : CO/CM/IF/CW
Semester : Fifth
Course Title : Advanced Computer Network (Elective)
Course Code : 22520

1. RATIONALE

The modern computer network includes different routing protocols and applying the concepts of network, transport and application layer protocols. In order to work with existing technology in building large, complex networked systems, students must be acquainted with the principles, architectures, and protocols used in modern networked systems. This course covers advanced computer network protocols, and advanced principles of the design of computer networks. After completing this course students will be able to configure various TCP/IP protocols at different layers.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Configure network protocols at different layers of TCP/IP protocol set.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following *industry oriented* COs associated with the above mentioned competency:

- Implement Network Layer Protocols.
- Configure IPv6 Network.
- Choose routing protocol in the given network situation.
- Implement different Transport Layer Protocols.
- Configure various Application Layer Protocols.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
L	T	P		Theory								Practical					
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	5	3	70	28	30*	00	100	40	25#	10	25	10	50	20	

(*): Under the theory PA; Out of 30 marks, 10 marks of theory PA are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs.

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit, ESE - End Semester Examination; PA - Progressive Assessment.

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the



course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

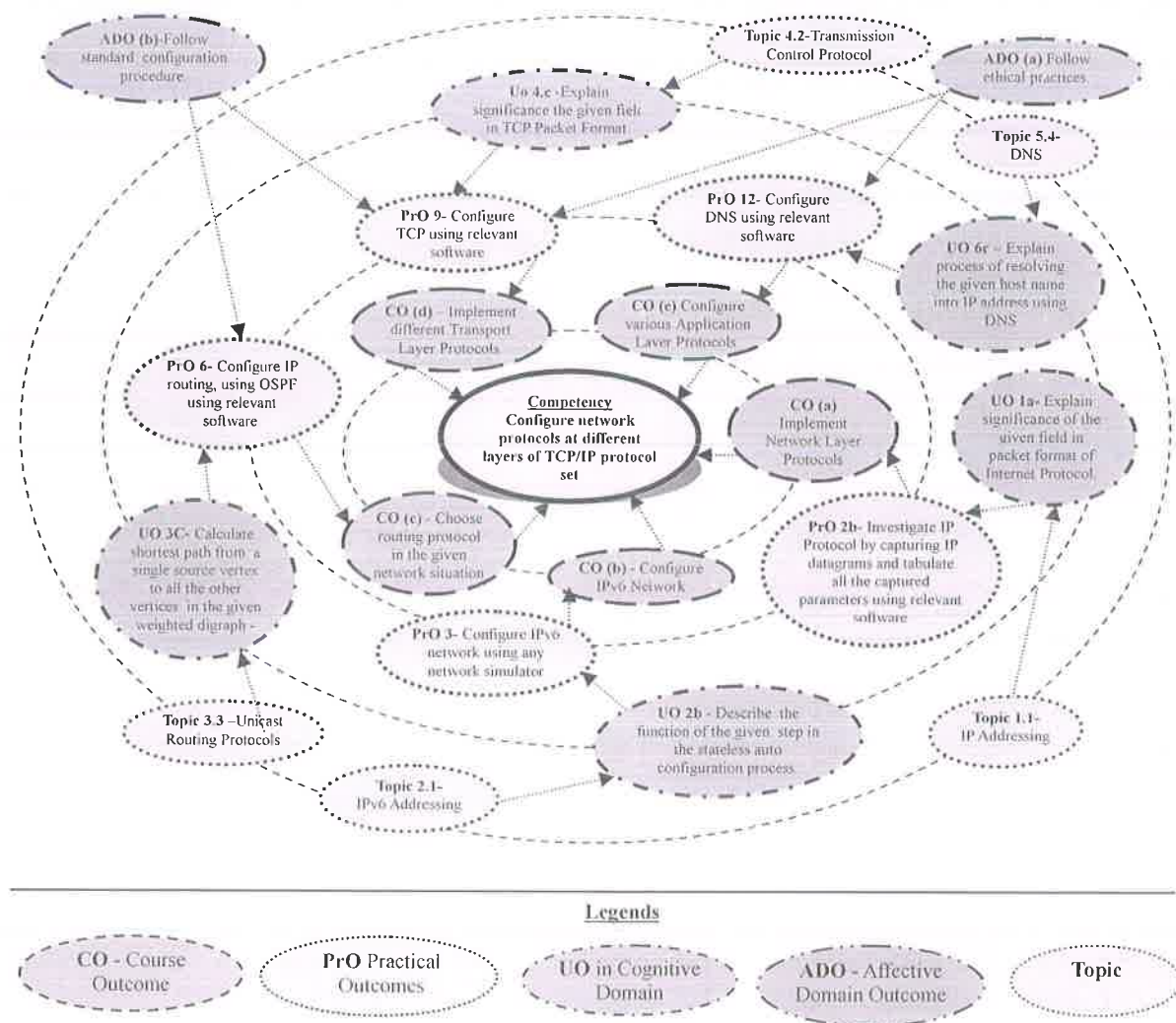


Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	Given an IP address, network mask, and subnetwork mask, determine other information and implement it. about the IP address such as: - The subnet address of this subnet. - The broadcast address of this subnet. - The range of host addresses for this subnet. - The maximum number of subnets for this subnet mask. - The number of hosts for each subnet. - The number of subnet bits.	I	2

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
	vii. The number of this subnet.		
2.	a. Capture ICMPv4 packets generated by utility programs like ping, traceroute and tabulate all the captured parameters using relevant software. b. Investigate IP Protocol by capturing IP datagrams and tabulate all the captured parameters using relevant software	I	2*
3.	Configure IPv6 network using any network simulator.	II	2*
4.	Configure IP static routing using relevant software.	III	02
5.	Configure IP routing with RIP using relevant software.	III	02*
6.	Configure IP routing with OSPF using relevant software	III	02*
7.	Configure User Datagram Protocol (UDP) Part-I using relevant software.	IV	02*
8.	Configure User Datagram Protocol (UDP) Part-II using relevant software.	IV	02*
9.	Configure Transmission Control Protocol (TCP) using relevant software.	IV	02*
10.	Run different STCP commands.	IV	02
11.	Configure Dynamic Host Configuration Protocol (DHCP) using relevant software.	V	02*
12.	Configure Domain Name Server (DNS) using relevant software.	V	02*
13.	a. Configure File Transfer Protocol (FTP) using relevant software. b. Configure Hypertext Transfer Protocol (HTTP) using relevant software.	V	02*
14.	a. Use Telnet to login a remote machine. b. Connect remote machine using Secure Shell (SSH).	V	02*
15.	Configure SMTP, POP3 and IMAP using relevant software.	V	02*
16.	Configure MIME and SNMP using relevant software.	V	02
	Total		32

Note

- A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 12 or more practicals need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Application Level' of Bloom's Taxonomy as generally required by the industry.
- The 'Process' and 'Product' related skills associated with each PrO are to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
1.	Completion of given task.	25
2.	Correctness of the given task.	50
3.	Answer to sample questions.	15
4.	Submit report in time.	10
	Total	100



The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- Follow safety practices.
- Practice good housekeeping.
- Work as a leader/a team member.
- Follow standard configuration procedures.
- Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year and
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO S. No.
1	Computer system (Any computer system with basic configuration, connected to LAN)	All
2	Wireshark or any other similar software to capture and investigate packets	1, 2
3	Cisco Packet Tracer or any other similar software	3 to 16

8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Network Layer and Protocols	1a. Explain significance of the given field in the packet format of Internet Protocol. 1b. Implement IP addressing for the given network. 1c. Explain significance of the given field in packet format of ICMPv4. 1d. Explain the given inefficiency in Mobile IP.	1.1 IP Addressing: Address Space, Notations, Classful addressing, Classless addressing, Network Address Translation (NAT). 1.2 Internet Protocol (IP): Datagram Format, Fragmentation, Options. 1.3 ICMPv4: Messages, Debugging Tools, ICMP Checksum. 1.4 Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP. 1.5 Virtual Private Network: Technology.



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit– II Next Generation IP	2a. Map the given IPv4 address to IPv6 address. 2b. Describe function of the given step in the stateless auto configuration process. 2c. Outline the given strategy of Transition from IPv4 to IPv6. 2d. Explain significance of the given field in Datagram format of IPv6.	2.1 IPv6 Addressing: Representation, address space, address space allocation, Autoconfiguration, Renumbering. 2.2 Transition from IPv4 to IPv6: Dual Stack, Tunneling, Header Translation. 2.3 IPv6 Protocol: Packet format, Extension Header.
Unit III- Unicast and Multicast Routing Protocols	3a. Choose relevant routing Protocol for the given network situation. 3b. Compare Dynamic Routing and Static Routing on the given aspect. 3c. Calculate shortest paths from a single source vertex to all the other vertices in the given weighted digraph. 3d. Explain functioning of the given multicast routing protocol.	3.1 Introduction: Inter-domain, Intra-domain Routing. 3.2 Routing Algorithms: Distance Vector Routing, Bellman–Ford algorithm, Link State Routing, Path Vector Routing. 3.3 Unicast Routing Protocols: Internet Structure, Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Border Gateway Protocol Version 4 (BGP4). 3.4 Introduction: Unicast, Multicast and Broadcast. 3.5 Intradomain Multicast Protocols: Multicast Distance Vector (DVMRP), Multicast Link State (MOSPF), Protocol Independent Multicast (PIM).
Unit-IV Transport Layer Protocols	4a. Explain significance of the given field in UDP Packet format. 4b. Describe the given State Transition of TCP. 4c. Explain significance of the given field in TCP Packet format. 4d. Describe the given field in the packet format of SCTP. 4e. Explain the functioning of the given Protocol with Flow and Error control by taking an example.	4.1 User Datagram Protocol: User Datagram, UDP Services, UDP Applications. 4.2 Transmission Control Protocol: TCP Services, TCP features, Segment, A TCP Connection, State Transition Diagram, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, TCP Timers, Options. 4.3 SCTP: SCTP Services, SCTP Features, Packet Format, An SCTP Association, Flow Control, Error Control.
Unit –V Application Layer	5a. Explain function of the given application layer protocol. 5b. Explain function of the given	5.1 World Wide Web and HTTP 5.2 File Transfer: FTP and TFTP 5.3 Electronic Mail: Architecture,



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
protocols	FTP command. 5c. Explain working of the given components in the Architecture of Electronic Mail. 5d. Explain process of resolving the given host name into IP address using DNS. 5e. Explain working of the given Remote Login Protocol.	Web-Based Mail, Email Security, SMTP, POP, IMAP and MIME, SNMP. 5.4 DNS – Concept of Domain name space, DNS operation. 5.5 DHCP – Static and Dynamic Allocation, DHCP Operation. 5.6 Remote Login: TELNET and SSH.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Network Layer and Protocols	06	02	02	04	08
II	Next Generation IP	08	02	04	04	10
III	Unicast and Multicast Routing Protocols.	10	02	04	08	14
IV	Transport Layer Protocols	12	02	08	08	18
V	Application Layer Protocols.	12	04	08	08	20
Total		48	12	26	32	70

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Prepare journals based on practical performed in laboratory.
- Give seminar on Identified topic.
- Undertake micro-projects.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various learning outcomes in this course:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- 'L' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.



- c. About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).
- d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
- e. Guide student(s) in undertaking micro-projects.
- f. Demonstrate students thoroughly before they start doing the practice.
- g. Encourage students to refer different websites to have deeper understanding of the topic.
- h. Observe continuously and monitor the performance of students in Lab.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be **individually** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

- i. Prepare one Static and One dynamic Network with DHCP server. Use Routing Protocol to route packets between these networks using Cisco packet tracer or any other similar software.
- ii. Setup a FTP server and client on one network. Transfer files from Client to server and vice versa.
- iii. (a) Create DNS,
(b) Create Web server,
(c) Serve an HTML page on web server and call it on browser through DNS.
- iv. Set-up a mailing system of users on intranet.

13. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Data Communication and Networking 5E	Forouzan Behrouz A.	McGraw Hill Education (India), New Delhi, 2005, ISBN-13:978-1-25-906475-3
2	Internetworking with TCP/IP, Volume I, Fourth Edition.	Comer Douglas E.	Prentice Hall of India Private Limited, New Delhi, 2014 ISBN-81-203-2065-4
3	Computer Networks, Fourth Edition	Tanenbaum Andrew S.	PHI Learning, New Delhi- 2014 ISBN-81-203-2175-8



4	Advanced Computer Network	B.M. Harwani and DT Editorial Services	Dreamtech New Delhi- 2014 ISBN 978-93-5004-013-3
5	Computer Networks Principles, Technologies And Protocols For Network Design	Natalia Olifer, Victor Olifer	Wiley ISBN

14. SOFTWARE/LEARNING WEBSITES

- a) TCP/IP Illustrated, Volume 1 The Protocols W. Richard Stevens
- b) <http://study-ccna.com/>
- c) <http://www.packettracernetwork.com/>
- d) <https://www.tutorialspoint.com/listtutorials/networking/1>
- e) www.txv6tf.org/wp-content/uploads/2010/08/Muhummad-Tutorial-ipv6-basics.pdf
- f) <http://cnp3book.info.ucl.ac.be/2nd/html/protocols/bgp.html>
- g) <https://campus.barracuda.com/product/nextgenfirewall/doc/46209264/dynamic-routing-protocols-ospf-rip-bgp/>
- h) <http://www.ciscopress.com/articles/article.asp?p=2180210andseqNum=5>
- i) http://www.allsyllabus.com/aj/note/Computer_Science/Computer%20Networks%20-%20II/



Program Name : Diploma in Information Technology
Program Code : IF
Semester : Fifth
Course Title : Open Source Operating System & Scripting Language (Elective)
Course Code : 22522

1. RATIONALE

Operating System is the interface between the user and the computer system. Nowadays LINUX is one of the most widely used operating system. Knowledge of LINUX operating system is essential as it provides many features such as multitasking, multiuser, security etc. which are mainly used in both server and workstation systems. So, this course will enable the students to inculcate the basics of LINUX Operating System, writing Shell scripts as well as administer the network.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Maintain Linux Operating System.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following *industry oriented* COs associated with the above mentioned competency:

- Install Linux Operating System.
- Use Basic Linux commands and utilities.
- Develop Shell program for solving different problems.
- Maintain Linux Operating System.
- Maintain Linux Network Services.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	-	2	5	3	70	28	30*	00	100	40	25#	10	25	10	50	20

(*): Under the theory PA; Out of 30 marks, 10 marks of theory PA are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs.

Legends: **L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** -Practical; **C** – Credit, **ESE** -End Semester Examination; **PA** - Progressive Assessment.

5. COURSE MAP(with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the



course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

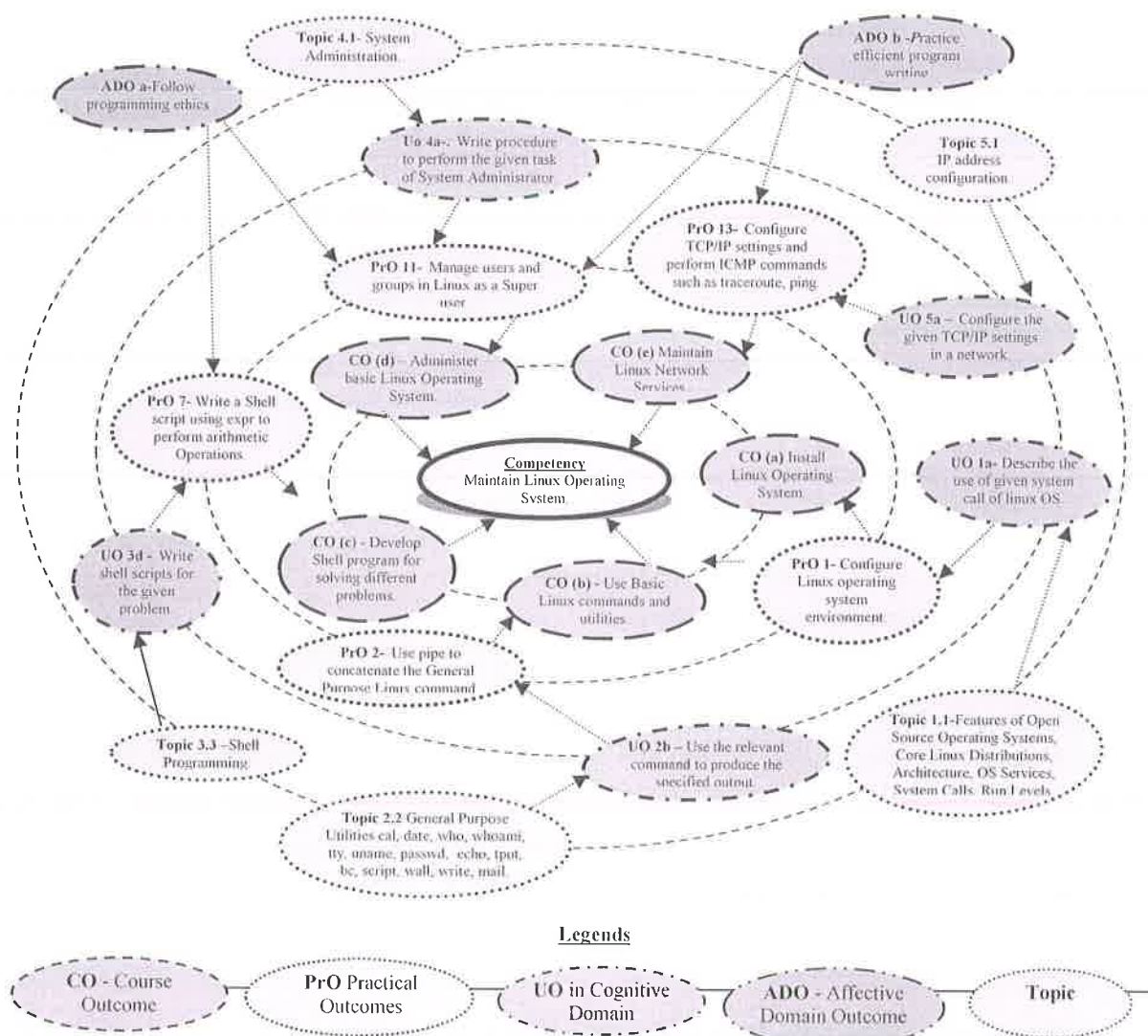


Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	Configure Linux operating system environment.	I	02*
2.	Use pipe to concatenate the General Purpose Linux command.	II	02*
3.	Manage file permissions using chmod.	II	02*
4.	Use pattern Searching using <i>grep</i> family commands.	II	02*
5.	Use text Editor in different Modes.	III	02*
6.	Write a Shell script using following Control Structures : a) <i>if then else</i> structure and nested <i>if then</i> Structure. b) <i>Case</i> Statement.	III	02*

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
7.	Write a Shell script using expr to perform arithmetic Operations.	III	02
8.	Write a Shell script using following loop structure: a) For loop. b) While loop. c) Until.	III	02*
9.	Write a Shell script using test command to check a) Two variables using -eq, -ge, -gt, -le, -lt, -ne. b) Existence of file, file as a directory, file size greater than zero.	III	02
10.	Write a login Shell script to perform a) Verify that your Shell, Looking at Current Values b) Editing Current Values, Test New Prompts.	III	02
11.	Manage users and groups in Linux as a Super user,.	IV	02*
12.	Work with init level during startup and shut down of Linux OS.	IV	02*
13.	Configure TCP/IP settings and perform ICMP commands such as traceroute, ping.	V	02*
14.	Configure DHCP Server and DHCP Client.	V	02*
15.	Configure an IP table firewall in Linux for security.	V	02*
16.	Configure NFS server in Linux Operating System.	V	02*
Total			32

Note

- A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Application Level' of Bloom's Taxonomy' as generally required by the industry.
- The 'Process' and 'Product' related skills associated with each PrO are to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
1	Configuration of Linux operating system	25
2	Correctness of Executing various commands	25
3	Writing and executing shell script to get desired output	20
4	Debugging the program	15
5	Submit journal report in time	15
Total		100

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- Follow safety practices.
- Practice good housekeeping.
- Demonstrate working as a leader/a team member.
- Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of



practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year and
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO S. No.
1	Computer system (Any computer system with basic configuration)	All
2	Linux operating system.	

8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Features of Linux Operating System	1a. Describe the use of given system call of linux OS. 1b. Determine the file type on the basis of first character of ls command output for the given computer system. 1c. Describe the given phase of state transition for the process states. 1d. Outline salient features of the given Linux shell.	1.1 Features of Open Source Operating Systems, Core Linux Distributions, Architecture, OS Services, System Calls, Run Levels. 1.2 File System : Hierarchical File System, File System features, Data Structures. 1.3 Process : Process concepts, context of process, Context Switch, Process State, State Transition diagram, Data Structure for processes. 1.4 Shell : Login into the system, Concept of Shell, Various Linux Shell and their Features.
Unit-II Linux Command s and Utilities	2a. Classify the given command as internal or external. 2b. Use the relevant command to produce the specified output. 2c. Use relevant file and directory command(s) to perform the specified operation. 2d. Apply the specified permissions to file and directory.	2.1 Locating Commands, Internal & External Commands, Arguments, Options & Filenames, Online help 2.2 General Purpose Utilities cal, date, who, whoami, tty, uname, passwd, echo, tput, bc, script, wall, write, mail. 2.3 Navigating the File System Concepts: Files, Directories, Paths, Home Directory, Parent-Child Relationship, Handling Command.- pwd, cd, mkdir, rmdir, ls Ordinary Files handling commands: cat, cp, rm, mv, file, wc, cmp, comm, diff 2.4 File Attributes : File Permissions, listing file



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		permissions, chmod Command 2.5 grep Family: Regular expressions, grep, egrep, fgrep, tr.
Unit– III Shell Programm ing	3a. Use vi editor in the specified mode to carry out the given operation. 3b. Apply relevant wild card for the given pattern matching. 3c. Create conditional statement using logical and relational operators to implement the given criteria. 3d. Write shell scripts for the given problem.	3.1 vi Editor: Modes of vi, commands in various modes - creating, editing, saving and quitting 3.2 Shell, sh Command, Pattern Matching-the Wild Cards, Escaping-the Backslash(\), Quoting, Redirection, Pipes, Tees, Command Substitution, Shell Variables 3.3 Shell Programming: Shell Scripts, read Statement, Command Line Arguments- Positional Parameters, Exit Status of Command, Logical Operators && and , exit Statement, if and case Statements, expr Statement, while, until and for Statements, Sample Validation & Data Entry. 3.4 Simple Scripts, Scripts Using Simple Commands
Unit– IV Basic Linux System Administrat ion	4a. Write procedure to perform the given task of System Administrator. 4b. Explain purpose of using the given run level. 4c. Write procedure to perform the given operation for managing the users/groups. 4d. Use relevant command as per the given disk management operation.	4.1 System Administration: Role of Administrator, root- Administrator's Login, su: Acquiring superuser Status, Administrator's Privileges- passwd Commands, Task Scheduling using cron, Maintaining Security. 4.2 Operations: Startup and shutdown, System runlevels 4.3 User management : User configuration and password file, Managing Users and Groups, 4.4 Managing Disk Space : df, du, find command- Locating files dd, Command-Copying Disks, disk management-RAID. 4.5 Backups: Need of backup, cpio & tar commands.
Unit –V Basic Network Managemen t.	5a. Configure the given TCP/IP settings in a network. 5b. Configure the given setting in DHCP Server/Client. 5c. Write method to configure setting in firewall to apply the given network security feature. 5d. Use specified utility/software for Network Intrusion	5.1 IP address configuration: TCP/IP Network address, TCP/IP Configuration files, Network Interfaces and Routes : ifconfig, route, ping, netstat, tcpdump commands 5.2 DHCP Server Configuration Configuring DHCP Client and Server, Dynamic Address, Fixed Addresses. 5.3 NIS, NFS, SAMBA introduction. 5.4 Firewall and Internet Security: Limiting Network Services, Designing Firewall. 5.5 Network Intrusion Detection: Host based Intrusion Detection Software using <i>tripwire</i> or <i>any relevant utility</i> .



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	Detection.	

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Features of Linux Operating System	08	04	06	02	12
II	Linux Commands and Utilities	12	02	04	10	16
III	Shell Programming	12	02	04	12	18
IV	Basic Linux System Administration	10	02	04	08	14
V	Basic Network Management	06	02	04	04	10
Total		48	12	22	36	70

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

Note: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of LOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Prepare journals based on practical performed in laboratory.
- Prepare power point presentation for understanding different Linux Operating System distribution.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- 'L' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).
- With respect to item No.10, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
- Use different Audio Visual media for Concept understanding.
- Guide student(s) in undertaking micro-projects.



- g. Demonstrate students thoroughly before they start doing the practice.
- h. Observe continuously and monitor the performance of students in Lab.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be **individually** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects are given here. Similar micro-projects could be added by the concerned faculty:

- a) Configure following Common Services (Client AND Server)
 - DHCP, DNS, LDAP, Email (SMTP, POP, IMAP)
- b) Build a NAS
- c) Configure NFS, Samba
- d) Configure Proxy Server, Web server
 - Squid, Apache

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1.	Unix Concept and Programming	Das, Sumitabha	McGraw Hill education, New Delhi, 2015, ISBN: 978-0070635463
2.	Linux Command Line and Shell Scripting Bible, 3 rd Edition	Blum, Richard, Bresnahan, Christine	Wiley Publication, New Delhi, 2015, ISBN:- 978-1-118-98384-3
3.	Red Hat: The Complete Reference Enterprise Linux and Fedora Edition	Piterson, Richard	McGraw Hill education, New Delhi , ISBN:-0-7-058709-4
4.	Red Hat Linux Networking and System Administration	Colling, Terri & Wall, Kurt	Red Hat ISBN: 0-7645-3632-X

14. SOFTWARE/LEARNING WEBSITES

- a) <https://www.linode.com/docs/tools-reference/linux-system-administration-basics>.
- b) <http://training.linuxfoundation.org/free-linux-training>.
- c) <https://www.javatpoint.com/linux-tutorial>
- d) <http://www.tutorialspoint.com/listtutorials/linux/1>
- e) <https://www.digitalocean.com/community/tutorials/how-to-customize-your-bash-prompt-on-a-linux-vps>



